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Kentucky Naturalist News

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Falls of the Ohio Chapter (Louisville), 9109 Hawthorne Pointe Drive, Louisville, KY 40272, **meets every 3rd Thursday** of each month except Jan, Jul, Aug, & Dec at 7:00 PM at the **Louisville Nature Center**, 3745 Illinois Ave, Louisville, 40213. Call President Chris Bidwell at (502) 458-1328, or via email (mabteacher1@yahoo.com).

Wilderness Trail Chapter (Pineville) meets the first Thursday of each month, March through December, at 7:00 p.m., generally at Pine Mountain State Resort Park in the Ray Harm Room, 1050 State Park Road Pineville, KY 40977-0610 (800-325-1712). Call President Tom Toole at (606) 248-3078, or via email (tom.tdtoole@gmail.com).



A hibernating *Corynorhinus rafinesquii* (Lesson, 1827) (**Rafinesque's big-eared bat**) from Powell County, KY., just weeks before the spring warm up. Photo by Barry Nichols, 2011. The inset shows the same species alert and listening with amazing ears, Mammoth Cave National Park. Photo also by Nichols, 2006.

EDITOR'S NOTES

The **2011 KSNH Spring Conference** at **Carter Caves State Park**, April 15 – 17, 2011, is almost upon us! A preliminary agenda for the meeting is

contained within this issue. If you no longer have the registration form from the last issue you can get it online at the [KSNH website](#).

Wren Smith, the 2010 KSNH Naturalist of the Year Award winner was featured in an article written by KSNH member Dick Dennis in the [National Association for Interpretation's NAI Now](#), Volume 5, Number 24 (December 21, 2010). The article was entitled, "[Wren Smith named Naturalist of the Year](#)." This article was distributed to over 4,500 interpretive professionals around the world. Kudos are extended again to Wren for all of her hard work and subsequent recognition. Kudos are also extended to Dick Dennis for his fine NAI article.

Also, some early information about the KSNH Fall 2011 meeting at [Cumberland Falls State Resort Park](#) will be available in the next newsletter. Stay tuned!

Please note: The deadline for submissions for the next issue (KNN Summer 2011) is May 1, 2011. –barry

PTERIDOPHYTES OF CHEROKEE AND IROQUOIS PARKS (LOUISVILLE, KY)

by Chris Bidwell

[Pteridophytes](#) are [ferns](#) and [fern allies](#). They are seedless vascular plants that reproduce by [spores](#) on fronds (leaves) or modified leaves – sporophylls. [Ferns](#) date back to about 400 million years. For those of us who walk at the flagship [Olmsted Parks](#) of [Cherokee](#) and [Iroquois](#), one may encounter several types of [ferns](#). Although most [ferns](#) are of little value to wildlife, some with evergreen fronds do serve as a food source during the winter. It is their beauty that attracts most nature lovers to [ferns](#). Most are found in wet woods/wetlands as they all need water for fertilization. We have photographed nine [ferns](#) at these two [Olmsted parks](#) and we hope our pictures and brief notes will help you to identify and enjoy these wonderful yet often overlooked plants – the [ferns](#).

A) [Asplenium platyneuron \(Linnaeus\) Britton, Sterns & Poggenburg](#), 1888 ([ebony spleenwort](#)) – is frequent and found in woodland soils and on rock outcroppings statewide. It is a very delicate looking [fern](#) with a dark brown/mahogany leaf stalk (rachis). Photo by Susan Wilson.



B) *Asplenium rhizophyllum* Linnaeus, 1753 ([walking fern](#)) – is found on moss covered limestone, sandstone, or logs. The fronds, triangular/long arrow shaped leaves, often re-root once their elongated tips contact substrate and begin a new series of [ferns](#). It is common throughout the state. Photo by Susan Wilson.



C) *Cystopteris protrusa* (Weatherby) Blasdel, 1963 ([Southern bladder fern](#), [fragile fern](#), [lowland bladderfern](#)) – is another frequent statewide [fern](#) found in mesic woods, prominent from June through September. The raised, rounded spore cases (sori), underneath the fertile leaves, resemble bladders. It really is a fragile [fern](#) because it breaks easily at the base. Photo by Susan Wilson.



D) *Onoclea sensibilis* L., 1753 ([sensitive fern](#), [bead fern](#)) – A frequent [fern](#) found in wet woods, meadows, swamps, muddy areas, and wetlands in late summer and often lasting into the winter. It is one of the first [ferns](#) to fade with frost – hence it is “sensitive” to cold weather. Photo by Susan Wilson.



E) *Polystichum acrostichoides* (Michaux)
Schott, 1834 (Christmas fern) – An abundant statewide fern called Christmas fern as each leaflet has a lobe at the base that resembles Santa's boot or a Christmas stocking. In dry-to-wet woods, it can be seen from June to September and well into winter, when its darkened green fronds give a splash of color. Ruffed grouse and turkey feed on the fronds in winter. Photo by Susan Wilson.



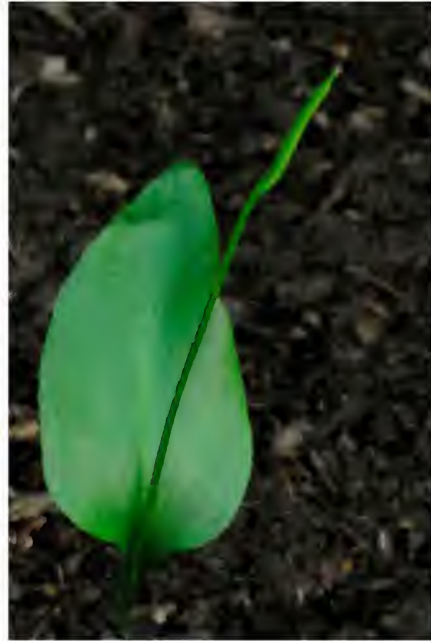
F) *Botrychium biternatum* (Savigny)
Underwood, 1896 (sparse-lobed grape fern) – An infrequent fern of wet woods and fields in August through October across Kentucky. Spores on a stalk resemble grapes on a vine. Photo by Susan Wilson.



G) *Botrychium virginianum* (Linnaeus) Swartz, 1800 (common grape fern) – Also called Virginia grape fern, spring grape fern, and rattlesnake fern. It is our most common grape fern. It is a spring fern maturing in April through June in dry to wet woods across Kentucky. Ruffed grouse and wild turkey feed on both of these grape ferns. Photo by Susan Wilson.



H) *Ophioglossum vulgatum* L., 1753
([Southern adderstongue](#)) – Seen in mesic to wet woods across Kentucky May through July. It is frequent and the most common of the Adder Tongue ferns in Kentucky. This [fern](#) doesn't look like a "typical" [fern](#). A single 2-3 inch oval-blunt, entire leaf may be mistaken for a flowering plant. Photo by Susan Wilson.



I) *Phegopteris hexagonoptera* (Michaux) Fée, 1852 ([Southern beech fern](#), [broad beech fern](#)) – Found in moist woods and non-calcareous areas across Kentucky. It is common June through September. A [deciduous fern](#) that has a triangular leaf divided into opposite leaflets which are fused to the winged leaf stalk. It is called [Beech fern](#) because it is often found around beech trees. However is actually is more associated with oaks. Photo by Susan Wilson.



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- Barnes, T.G. and S.W. Francis. 2004. Wildflowers and Ferns of Kentucky. University Press of Kentucky, Lexington KY, 344 pp.
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- Wharton, Mary E. and R. W. Barbour. 1971. A Guide to the Wildflowers and Ferns of Kentucky. University Press of Kentucky, Lexington, KY. 344 pp.

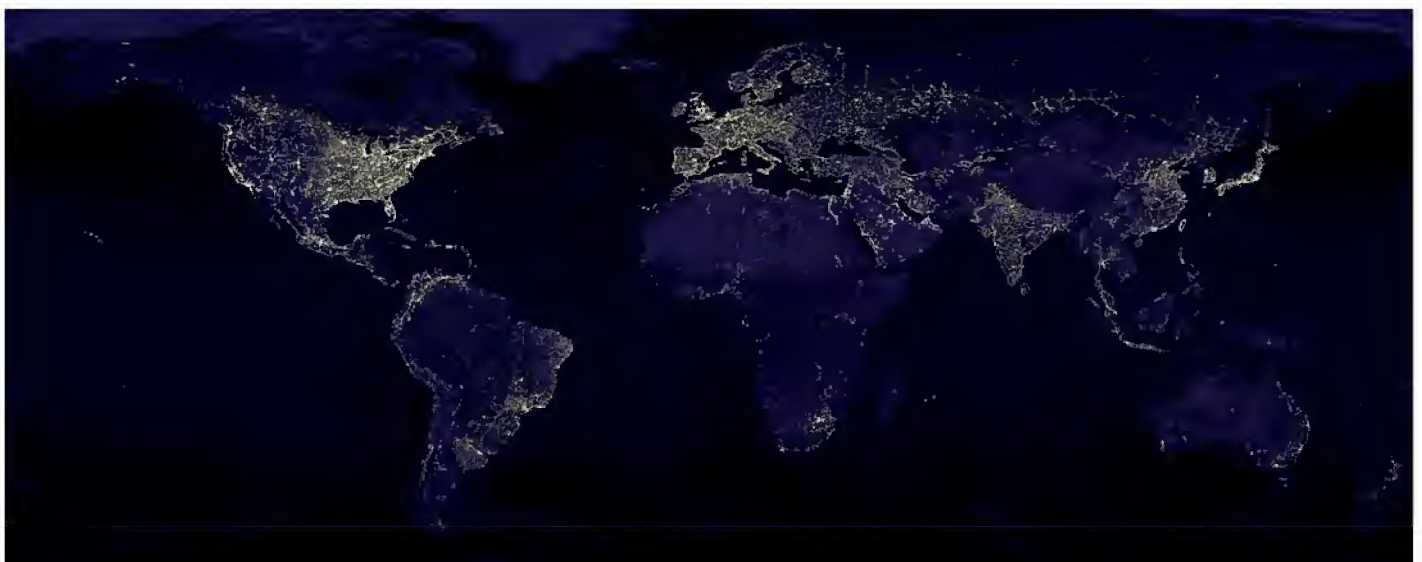
Chris Bidwell is an amateur naturalist and the current President of the Falls of the Ohio Chapter of KSNH. He thanks Mary Alice Bidwell for her keen typing skills.

STUDYING LIGHT POLLUTION IN YOUR BACKYARD AND AROUND THE GLOBE

by Shannon R. Trimboli

For millions of years the brightest object in our night sky was the [moon](#). That is no longer true. Today electric lights illuminate the [night sky](#) creating [light pollution](#). In some cities [light pollution](#) has become so bad that the [stars](#) are barely visible. Over two thirds of the US population and approximately one fifth of the world population cannot see the [Milky Way](#) from where they live.

Cities aren't the only locations impacted by [light pollution](#). [National Parks](#) and other places that we consider [wilderness](#) are being impacted. In 1999, the [National Park Service](#) formed the [Night Sky Team](#) to begin monitoring [light pollution](#) in the [National Parks](#). They have found that almost every [National Park](#) in the continental US is somehow impacted by [light pollution](#). Scientists from the US and Italy estimate that at the current rate of yearly increase in [light pollution](#) only 1% of the world's population will live under "[dark skies](#)" within the next 14 years.



Picture from space showing how the world looks at night from outer space. Photo by NASA/GSFC/Craig Mayhew and Robert Simmon.

[Light pollution](#) affects not just people's view of the [night sky](#), but also the activities of many species of [wildlife](#). Several species of [birds](#) will sing earlier in the morning or later in the evening in the presence of anthropogenic lights. [One study](#) found that [birds](#) in areas with higher level of artificial lights begin laying their eggs earlier than birds living in darker areas.

Street lights and other bright lights can attract [insects](#) and thus provide a concentrated feeding site for [bats](#). However, at least one species in Europe, the [lesser horseshoe bat](#), appears to avoid street lights, even in areas the [bats](#) used before the lights were installed. Artificial lights are also being investigated as a possible culprit in the decline of [firefly populations](#).

The impacts of brightly lit beaches on [sea turtle hatchlings](#) have been well documented. Even [plants](#) may be affected by anthropogenic light with [trees](#) near bright lights being reported as retaining their leaves longer in the fall than other [trees](#) in the area.

In 2006, the [GLOBE at Night citizen science project](#) was started to monitor [light pollution](#) around the world. The project takes place worldwide for two weeks in late February and early March, and then again for each hemisphere in late March and early April. The dates are set according to when the [constellation Orion](#) is visible to everyone and the [moon](#) won't interfere with early evening observations. This year the dates of the project are worldwide: **February 21 to March 6, 2011** and in the [Northern Hemisphere](#): **March 22 to April 4, 2011**.

Anyone can participate in [GLOBE at Night](#). To participate, simply go outside on a clear night during the count period approximately an hour after sunset and find [Orion](#). Compare how bright the [constellation](#) appears from your location to the magnitude charts located on the website. Record your latitude and longitude. Then report your observations and location on the [GLOBE at Night](#) website. Results, including a map and full datasets, are posted on the website and are available for anyone to explore.

The [GLOBE at Night website](#) has many activities to help you prepare for participating in the project. Interactive activities are available to help you find [Orion](#) and to show you what the constellation looks like under different levels of [light pollution](#). Activity guides are also available in several different languages to help students, teachers, and parents interested in participating in the project.

Why not take a few minutes this spring to go outside, look up at the night sky, and help scientists quantify the amount of [light pollution](#) where you live?

Shannon Trimboli enjoys exploring the outdoors, conducting research, teaching others about nature, and helping people become involved in citizen science projects. Much of her free time is devoted to one of those activities. She is currently the Education Program Specialist at the [Mammoth Cave International Center for Science and Learning](#).

Resources:

Cinzano P, Falchi F, Elvidge CD. 2001. [cited 22 January 2011] The First World Atlas of the Artificial Night Sky Brightness. [Internet] Monthly Notices of the Royal Astronomical Society 328: 680-707. Available from: www.lightpollution.it/cinzano/download/0108052.

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Longcore T, Rich C. 2004. [cited 8 January 2011] Ecological Light Pollution. [Internet] *Frontiers in Ecological Environments* 2: 191-198. Available from: www.seaturtle.org/PDF/Longcore_2004_FrontEcolEnviron.pdf

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National Park Service. [cited 22 January 2011] Natural Lightscapes. [Internet] www.nature.nps.gov/air/lightscapes.

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MAGICICADA UPDATE: GET READY WESTERN KENTUCKY! BROOD XIX ARRIVES SHORTLY.

by Barry Nichols

As reported in the [Summer 2008 Kentucky Naturalist News](#), this year western Kentucky will see reemergence of the largest of the [13-year cicada](#) broods, [Brood XIX](#). There are four species of [cicada](#) within the genus [Magicicada](#) which make up [Brood XIX](#):

[Magicicada neotredecim](#) [Marshall and Cooley 2000](#)

[Magicicada tredecassini](#) [Alexander and Moore 1962](#)

[Magicicada tredecim](#) ([Walsh and Riley 1868](#))

[Magicicada tredecula](#) [Alexander and Moore 1962](#).

Start listening for the [cicada cacophony](#) right after you receive this newsletter! These highly beneficial insects will be emerging shortly thereafter. Enjoy the [periodical cicadas](#) while they're here. They will only be around for a few short weeks to [breed](#) and lay eggs. After that, [Brood XIX](#) will be gone until 2024. Kentucky will again experience [periodical cicadas](#) when the 13-year [Brood XXIII](#) emerges in 2015. After that, you'll also see [periodical cicadas](#) in the 2021 emergence of [Brood X](#), the 17-year [BROOD XIV](#) in 2025, and the 13-year [BROOD XXIII](#) again in 2028. Remember to report your sightings at <http://www.magicicada.org/report/report.php>.

*Barry Nichols is a biologist for state government and the current editor of the **Kentucky Naturalist News**. In his "spare time" he can be found ogling spiders, [plants](#), [herps](#), [birds](#), [mammals](#), or just about anything else he finds.*

References:

- Cooley, John R. 2011. www.magicicada.org. National Geographic Society Committee For Research And Exploration, 2011. Web. 1 Apr. 2011. <<http://www.magicicada.org/>>.
- Cooley, J & D.Marshall. 2010. Periodical Cicada Page. The University Of Michigan Museum Of Zoology - Insect Division. 12 Aug. 2010. Web. 1 Apr. 2011. <http://insects.ummz.lsa.umich.edu/fauna/Michigan_Cicadas/Periodical/Index.html>.

THE UNITED STATES NIGHTJAR SURVEY NETWORK NEEDS PARTICIPANTS IN 2011

by Kate Heyden

The [Center for Conservation Biology](#) developed the [Nightjar Survey Network](#) in 2007 to begin the process of collecting data on the population distribution and population trends of [nightjars](#). Very little is known about nightjar biology and prior to this program there was no widespread monitoring strategy for nightjars. Conservation-minded citizens, biologists, and other like-minded groups fuel the [Nightjar Survey Network](#) by volunteering to conduct [survey routes](#). Objectives of this project include gaining a better understanding of the population distribution and habitat use of [nightjars](#), as well as, detecting population changes on the long-term.

[Participation](#) is easy. Surveys are conducted along roads, at least 30 minutes after sunset, between moonrise and moonset and should take less than two hours to complete. Data forms can be submitted electronically or by mail. Those who participate will need:

1. Suitable transportation to complete a survey
2. Good hearing to count birds at a distance
3. Ability to recognize and differentiate calls of Kentucky Nightjar Species
4. Commitment to conduct a survey, once per year, for 3 or more years
5. Ability to schedule surveys during the survey window. (The 2011 survey windows are May 10-May 24 and June 9-July 23). Nocturnal behaviors of nightjars are strongly influenced by moonlight. Thus, survey windows are restricted to bright moonlit nights.

Please visit the following website to sign up for a survey route. Many Kentucky routes are currently vacant and your help is needed. At the website, you can also view project objectives and a report on findings from the initial years of survey.

www.ccb-wm.org/nightjars.htm

There is also an informative pamphlet available that you may share with friends:

<http://www.ccb-wm.org/nightjar/United%20States%20Nightjar%20Survey%20Network.pdf>

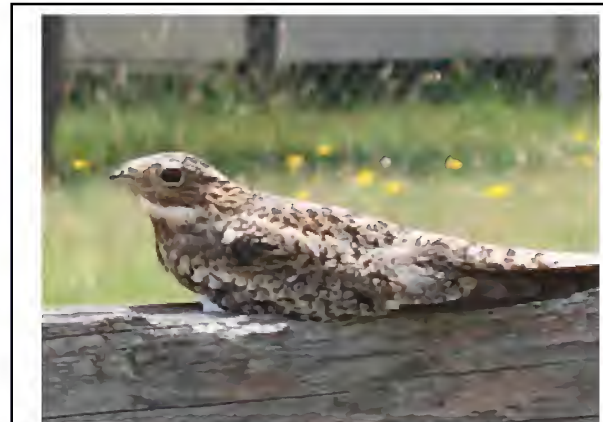
The species of nightjars that occur in Kentucky during the breeding season include:

[Caprimulgus vociferus](#) A. Wilson, 1812 ([Eastern whip-poor-will](#)) can be found statewide.

[Caprimulgus carolinensis](#) J. F. Gmelin, 1789 ([chuck-will's widow](#)) is found primarily west of the Cumberland Plateau.

[Chordeiles minor](#) (J. R. Forster, 1771) ([common nighthawk](#)) can be found statewide.

Visit www.enature.com or <http://www.birds.cornell.edu/AllAboutBirds/BirdGuide> and search for [nightjar](#) species to learn more about species identification.



Chordeiles minor (J. R. Forster, 1771) (common nighthawk) by Kate Heyden

This program's success relies entirely on volunteer participation and is a great way to get involved with [avian conservation](#). The efforts of volunteers and those which help recruit volunteers are much appreciated.

Kate Heyden is an avian biologist for the [Kentucky Department of Fish & Wildlife Resources](#). She specializes in raptors and songbirds. She previously worked on [red-cockaded woodpeckers in Louisiana](#) before moving to KY to work with the state about two years ago.

KENTUCKY SOCIETY OF NATURAL HISTORY ANNUAL SPRING CONFERENCE

CARTER CAVES STATE RESORT PARK

APRIL 15-17, 2011

The 2011 Spring Conference at [Carter Caves State Resort Park](#) will be on April 15 - 17, 2011! By now you've received the registration form but if you need another, it may be found at <http://ksnh.org/conference.html>.

Be careful on all of the field trips and watch your step. Watch out for uneven terrain, [venomous snakes](#) and [poison ivy](#). Be safe and have a great 2011 Spring Conference. All evening programs are in the Olive Room of the Lewis Caveland Lodge, all hikes will begin in the lodge lobby, and all meals are on-your-own.

The agenda is still being finalized, but the following is confirmed:

Friday, April 15, 2011

5:00 Dinner

7:00 Evening Program:

Welcome and Introductions –

Photography Program Topic – “Favorite Spring Nature Photo” – Susan Wilson

FEATURED PRESENTATION: “Remembering What I Can” - a look at half a century of spring's arrival at Carter Caves - **John Tierney**, Carter Caves State Park Naturalist Emeritus

Explanation of Saturday's Field Trips –

Saturday, April 16, 2011

SPECIAL NOTE: KSNH members can attend the [Cascade Caverns](#) cave tour of their choice on Saturday or Sunday at a reduced rate (Payable at time of tour, not included in conference registration - \$5.00 per person, reduced from \$9.00 per person).

9:00 AM - **Natural History Hike** to Box Canyon, Cascade Natural Bridge, and Tygart Creek Canyon - **John Tierney**, [Carter Caves State Park](#) Naturalist Emeritus

9:00 AM - **Stream Aquatic Macroinvertebrates** - [Josh Adkins](#), [University of Kentucky Entomology Department](#) (Be ready to get your feet wet- great for kids!)

2:00 PM - **Wildflower Hike** Along the Tygart Creek Floodplain (and hopefully see a *Pachystima* population in flower) - **John Tierney**, [Carter Caves State Park](#) Naturalist Emeritus

2:00 PM - **Amphibian Walk** to a natural sphagnum pond in search of four-toed salamander eggs plus a creek visit for other critters - with John MacGregor, [State Herpetologist](#), [Kentucky Department of Fish & Wildlife Resources](#).

2:00 PM - **Geology Hike**, a fairly easy-walking above-ground look at the [geology](#) of [Carter Caves State Park](#). - Jonathan Barker, [Division for Air Quality, Kentucky Department for Environmental Protection](#)

5:00 Dinner

7:00 Evening Program:

KSNH Student Presentation: “**Secret specialists: how Kentucky's frogs (may) share resources**”, by Carl Cloyed

FEATURED PRESENTATION: - “**Whatever Happened to Pluto?**” <followed immediately thereafter by stargazing with the speaker> - **Chad Howard**, Assistant Professor of Physics & Astronomy at [Jefferson Community and Technical College, Natural Science Division](#)

Sunday, April 17, 2011

SPECIAL NOTE: KSNH members can attend the [Cascade Caverns](#) cave tour of their choice on Saturday or Sunday at a reduced rate (Payable at time of tour, not included in conference registration - \$5.00 per person, reduced from \$9.00 per person).

8:00 AM - Bird Walk - Evelyn Morgan, [East Kentucky Bird Club](#)

NOTES FROM THE NATURE NUT

by W. H. (Wally) Roberts



As we all know, this winter has been unusually cold and snowy with little time between storms to do extended outdoor observations. It is now refreshing to hear the mating calls of [Pseudacris feriarum](#) (Baird, 1854) ([Upland Chorus Frog](#)), and [Pseudacris crucifer](#) (Wied-Neuwied, 1838) ([Northern Spring Peepers](#)), coming from our shallow ponds here at Hawthorne Pointe. These sounds along with the signs of spring plant development help fire eternal hopes for the coming of spring and a seasonal renewal of nature.

It will not be long now before the early arrivals of [migrating neotropical warblers](#) will grace our Kentucky woodlands. I only regret that my interest in these [warblers](#) did not occur during the early sixties when their numbers were sixty to eighty percent greater than today.

Although the main spring migration occurs during the first two weeks of May, the first of each species arrive on their breeding grounds here in Kentucky much earlier. I have chosen to discuss nine common warblers that first arrive in early, middle, or late April.

Some of the first warblers to arrive in Kentucky during early April are the [yellow-throats](#), the [black-throated greens](#), and the [black-and-whites](#).

[Dendroica dominica](#) (Linnaeus, 1766) [yellow-throated warbler](#), locally called “[sycamore warbler](#)”, can often be seen working the interior branches of trees after starting at the top branches. Its song is a rising high-pitched whistle, reaching its peak and then softly dropping down in pitch.

[Dendroica virens](#) (Gmelin, 1789), the [black-throated green warbler](#) is easily identified by its song which sounds like “zee-zee-zoo-zay”. Its yellow cheeks and black throat are tell-tale field marks, but birders often say the [black-throated green](#) is “often heard but seldom seen”.

The [Mniotilta varia](#) (Linnaeus, 1766), [black and white warbler](#), is a zebra striped bird that plucks moss from branches near the trunks of trees. Its [song](#) is a high-pitched thin “wee-see, wee-see, wee-see” often said to resemble the sound of a squeaky wheel.

During middle April, be sure to look for the arrival of [Northern parulas](#), [yellow warblers](#), and [ovenbirds](#).

[Parula americana](#) (Linnaeus, 1758), the [Northern parula](#), is one of our smallest [warblers](#) and can often be found in the tops of sweet gum trees near small streams. Its [song](#) is a trill reminiscent of a buzz rising up the scale reaching the top and ending in a lower zip note. Some birders say this [song](#) reminds them of the sound of a cup being filled with water, then suddenly spilling over.

[Dendroica petechia](#) (Linnaeus, 1766), the [yellow warbler](#), is a truly yellow warbler with reddish stripes on its breast. It prefers low shrubby vegetation and willows along small streams. Its [song](#) is clean and musical and sounds as if it is saying “sweet, sweet, I am so sweet” or “sweet, sweet, a little more sweet”.

[Seiurus aurocapilla](#) (Linnaeus, 1766), the [ovenbird](#) is shy and often times secretive as it forages, sings, and [nests](#) on the [forest](#) floor. Its song is a rising “teacher-teacher-teacher” or a singular rising “teach, teach, teach”, both of which stimulate competition from other mating [ovenbirds](#).

During late April, three of the last arriving warblers are the [common yellowthroats](#), [hooded warblers](#), and [Kentucky warblers](#).

[Geothlypis trichas](#) (Linnaeus, 1766), the [common yellowthroat](#), associates with brushy fence rows, open forest clearings, and along streams. Its wide black face mask makes it easily recognizable along with its bright yellow underparts. Its [song](#) is “witchy, witchy, witchy, witch” which carries far. It also responds to pishing sounds and is very inquisitive.

[Wilsonia citrina](#) (Boddaert, 1783) [hooded warblers](#) are distinctive and look like they have black hoods over their heads. They frequent undergrowth ravines and brushy stream borders. The [hooded warbler](#) is a persistent singer and its song sounds like a loud “wheeta, wheeta, wheeteo”.

The last of the late April arriving warblers is [Oporornis formosus](#) (A. Wilson, 1811), the [Kentucky warbler](#), our State namesake, and is a sleek looking [warbler](#) with dark sideburns. It frequents deep forests, dense ravines, and riparian bottoms and nests on the forest floor. This bird is a [persistent singer](#) and the loud “turdle, tur-dle”, or “churee, churee” notes carry far.

To become a better birder, I recommend you first learn the bird’s field marks, then the type of habitat the bird frequents, and finally become familiar with the bird’s song and call notes. Above all, get into the field as often as possible, take notes, and always try to bird with someone who is a better birder than you are and is willing to share his/her knowledge.

[Spring](#) is approaching rapidly so be prepared to enjoy the season since it is often much too short. I hope to see everyone at [Carter Caves](#)...it is a great place for spring flora, birds, and geologic formations.

*Wally Roberts was Kentucky Naturalist of the Year 2002. He is a long-time biology instructor, interpretive naturalist, and nature photographer. He graduated with a BS in Biology from [Morehead State University](#), and M.Ed. in Biological Education from the [University of Louisville](#). He's been President of KSNH (three times), former President of the Falls of the Ohio Chapter, and past President of the Board of the [Louisville Nature Center](#). He's currently the **Grant Coordinator** for KSNH.*

NEW MOTH (INSECTA: LEPIDOPTERA) RECORDS FROM KINGDOM COME

STATE PARK, HARLAN COUNTY, KENTUCKY

by Paul Florence

ABSTRACT

There are approximately 2475 species of [Lepidoptera in Kentucky](#) (Covell et al., 2000). Of these, over 2325 are [moths](#). The varying habitats in the southeastern region of Kentucky provide many opportunities to find new and exciting moth species. The **Cumberland Mountain** region has many different habitats including [old growth forest](#), [pine barrens](#), the highest altitude regions within the state ([Big Black Mountain](#)), and [sphagnum bogs](#). The study reported in this paper involved collecting moth specimens at [Kingdom Come State Park](#) in [Harlan County](#), Kentucky during the summer of 1999. [Moth](#) specimens were collected from pre-existing lights in the park beginning at the end of June and continuing into August. Moth specimens for 162 species were collected

and/or recorded from the park during the study period. There were 116 species that are [new records](#) for the park and 58 species that are new [Harlan County](#) records.

INTRODUCTION

[Kingdom Come State Park](#) is a 1,283-acre reserve located at the crest of [Pine Mountain](#) in [Harlan County](#) and [Letcher County](#) in Kentucky. The park is part of the [Cumberland Mountain Section](#) of the [Appalachian Plateaus Province](#) of [Kentucky](#). For information about the physiographic provinces, sections, and subsections see Burr and Warren (1986). Information concerning the moths previously recorded from this region can be found in Covell (1999).

MATERIALS & METHODS

Moth specimens were collected from pre-existing lights around the park from late June into August 1999. Specimens were collected from lights at night when they were flying to the lights and in the early mornings. Cyanide jars were used for euthanizing moth specimens, and the specimens were quickly placed into relaxing boxes. Specimens were spread, labeled, identified, and curated into insect cabinet drawers. Identification was accomplished by [A Field Guide To The Moths Of Eastern North America](#) (Covell, 1984), [The Cutworm Moths of Ontario and Quebec](#) (Rockburne & Lafontaine, 1976), and by using the University of Louisville insect collection. [Ed. Note: this collection has now been moved to the Kentucky Lepidoptera Collection housed at the University of Kentucky's [Dimock Animal Pathology Building](#) at 1081 V.A. Drive Bldg #76, Lexington, KY.] Most of the moth specimens were arranged into three drawers as a display for the park and are on exhibit in the gift shop.

RESULTS

Throughout the length of the collection period 162 moth species were recorded. Of these 162 species, 116 are new park records and 58 are new [Harlan County](#) records. Below is a list of the park (KGC) and county (HLN) records that were recorded. All species are listed in order of numbers assigned in Hodges et al. (1983), and are separated into their respective superfamilies, families, and subfamilies. Common names are given for those species that have them.

SUPERFAMILY [GELECHIOIDEA](#)

Family [Oecophoridae](#) - [Oecophorid Moths](#)

992 [Ethmia zelleriella](#) (Cham.), [Zeller's concealer moth](#); KGC

SUPERFAMILY [YPONOMEUTOIDEA](#)

Family [YPONOMEUTIDAE](#) - [Ermine Moths](#)

2420 [Yponomeuta multipunctella](#) Clem., [American ermine moth](#); KGC, HLN

SUPERFAMILY [COSSOIDEA](#)

Family [COSSIDAE](#) - [Carpenterworm and Leopard Moths](#)

2693 [Prionoxystus robiniae](#) (Peck.), [carpenterworm moth](#); KGC, HLN

SUPERFAMILY [TORTRICOIDEA](#)

Family [TORTRICIDAE](#) - [Tortricid Moths](#)

3497 [Ecdytolopha insitiana](#) Zell., [locust twig borer moth](#); KGC, HLN

SUPERFAMILY [ZYGAENOIDEA](#)

Family [MEGALOPYGIDAE](#) - [Flannel Moths](#)

4644 [Laqoa crispata](#) (Pack.), [black-waved flannel moth](#); KGC

Family [LIMACODIDAE](#) - [Slug Caterpillar Moths](#)

4654 [Tortricidia flexuosa](#) (Grt.) [abbreviated button slug moth](#); KGC

4659 [Packardia geminata](#) (Pack.), [jeweled tailed slug moth](#); KGC, HLN

4667 [Apoda y-inversum](#) (Pack.), [yellow-collared slug moth](#); KGC

4671 [Prolimacodes badia](#) (Hbn.), [skiff moth](#); KGC

4679 [Natada nasoni](#) (Grt.), [Nason's slug moth](#); KGC, HLN

4681 [Isa textula](#) (H.-S.), [crowned slug moth](#); KGC

4697 [Euclea delphinii](#) (Bdv.), [spiny oak-slug moth](#); KGC, HLN

4699 [Parasa indetermina](#) (Bdv.), [stinging rose caterpillar moth](#); KGC, HLN



Euclea nanina Dyar, 1891, *nanina* oak-slug moth. Photo by Carol Wolf (TN).



Parasa indetermina (Boisduval, 1832), stinging rose caterpillar moth. Photo by Carol Wolf (TN).

SUPERFAMILY [PYRALOIDEA](#)

Family [CRAMBIDAE](#) – [Crambine Snout Moths](#)

Subfamily [Pyrastinae](#)

- 4949 [Ostrinia nubilalis](#) (Hbn.), [European corn borer](#); KGC, HLN
 5058 [Pyrausta orphialis](#) Wlk., [orange mint moth](#); KGC, HLN
 5142 [Diacme elealis](#) (Wlk.), [paler diacme moth](#); KGC, HLN
 5156 [Nomophila nearctica](#) Mun., [Lucerne moth](#); KGC, HLN
 5159 [Desmia funeralis](#) (Hbn.), [grape leaffolder moth](#); KGC, HLN
 5182 [Blepharomastix ranalis](#) (Gn.), [hollow-spotted blepharomastix moth](#); KGC, HLN
 5241 [Pantographa limata](#) (G. & R.), [basswood leafroller moth](#); KGC

Subfamily [Crambinae](#)

- 5362 [Crambus agitatellus](#) Clem., [white-and-yellow crambus moth](#); KGC
 5420 [Microcrambus elegans](#) (Clem.), [elegant grass-veneer moth](#); KGC, HLN

Family [PYRALIDAE](#)

Subfamily [Chrysauginae](#)

- 5571 [Condylolomia participalis](#) Grt., [drab condylolomia moth](#); KGC

Subfamily [Epipaschiinae](#)

- 5606 [Pococera asperatella](#) (Clem.), [maple webworm moth](#); KGC

Subfamily [Phycitinae](#)

- 5997 [Euzophera ostricolorella](#) Hulst, [root collar borer moth](#); KGC, HLN

SUPERFAMILY [PTEROPHOROIDEA](#)

Family [PTEROPHORIDAE](#) – [Plume Moths](#)

- 6091 [Geina periscelidactyla](#) (Fitch), [grape plume moth](#); KGC, HLN
 6212 [Hellinsia kellicottii](#) (Fish), [goldenrod borer plume moth](#); KGC, HLN

SUPERFAMILY [DREPANOIDEA](#)

Family [Thyatiridae](#) – [Thyatirid Moths](#)

- 6235 [Habrosyne scripta](#) (Gosse), [lettered habrosyne, the scribe](#); KGC
 6237 [Pseudothyatira cymatophoroides](#) (Gn.), [tufted thyatrid](#); KGC

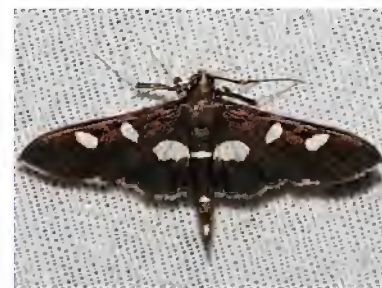
SUPERFAMILY GEOMETROIDEA

Family [GEOMETRIDAE](#) – [Loopers, Inchworms, Spanworms or Geometer Moths](#)

Subfamily [Ennominae](#)

- 6331 [Macaria promiscuata](#) Fgn., [promiscuous angle](#); KGC
 6599 [Epimecis hortaria](#) (F.), [tuliptree beauty](#); KGC
 6620 [Melanolophia canadaria](#) (Gn.), [Canadian melanolophia](#); KGC
 6720 [Lytrosis unitaria](#) (H.-S.), [common lytrosis](#); KGC, HLN
 6726 [Euchlaena obtusaria](#) (Hbn.), [obtuse euchlaena](#); KGC, HLN
 6753 [Pero honestaria](#) (Wlk.), [honest pero](#); KGC, HLN
 6796 [Campaea perlata](#) (Gn.), [pale beauty](#); KGC, HLN
 6842 [Plagodis phlogosaria](#) (Gn.), [straight-lined plagodis](#); KGC
 6843 [Plagodis fervidaria](#) (H.-S.), [fervid plagodis](#); KGC
 6906 [Nepytia canosaria](#) (Wlk.), [false hemlock looper moth](#); KGC, HLN
 6941 [Eusarca confusaria](#) Hbn., [confused eusarca](#); KGC
 6966 [Eutrapela clemataria](#) (J.E. Smith), [curve-toothed geometer](#); KGC
 6982 [Prochoerodes transversata](#) (Drury), [large maple spanworm moth](#); KGC, HLN

Subfamily [Geometrinae](#)



Desmia funeralis (Hübner, 1796), grape leaffolder moth. Photo by Carol Wolf (TN).



Euzophera ostricolorella Hulst, 1890, root collar borer moth. Photo by Carol Wolf (TN).



Geina periscelidactylus (Fitch, 1854), grape plume moth. Photo by Carol Wolf (TN).

- 7046 [*Nemoria bistraria*](#) Hbn., [two-striped emerald moth](#), [red-fringed emerald moth](#); KGC
 7075 [*Chloropteryx tepperaria*](#) (Hulst), [angle-winged emerald](#); KGC, HLN

Subfamily Sterrhinae

- 7139 [*Cyclophora pendulinaria*](#) (Gn.), [sweetfern geometer](#); KGC
 7159 [*Scopula limboundata*](#) (Haw.), [large lace-border](#); KGC

Subfamily Larentiinae

- 7196 [*Eulithis diversilineata*](#) (Hbn.), [lesser grapevine looper moth](#); KGC, HLN
 7214 [*Ecliptopera atricolorata*](#) (G.&R.), [dark-banded geometer](#); KGC
 7368 [*Xanthorhoe labradorensis*](#) (Pack.), [labrador carpet](#); KGC, HLN
 7390 [*Xanthorhoe lacustrata*](#) (Gn.), [toothed brown carpet](#); KGC
 7416 [*Orthonama centrostrigaria*](#) (Woll.), [bent-line carpet](#); KGC
 7422 [*Hydrelia inornata*](#) (Hulst), [unadorned carpet](#); KGC
 7440 [*Eubaphe mendica*](#) (Wlk.), [the beggar](#); KGC, HLN
 7647 [*Heterophleps triquttaria*](#) (H.-S.), [three-spotted fillip](#); KGC, HLN
 7648 [*Dyspteris abortivaria*](#) (H.-S.), [the bad-wing](#); KGC

SUPERFAMILY BOMBYCOIDEA

Family [APATELODIDAE](#) - [Apatelodid Moths](#)

- 7663 [*Apatelodes torrefacta*](#) (J.E. Smith), [spotted apatelodes](#); KGC

Family LASIOCAMPIDAE - [Tent Caterpillar and Lappet Moths](#)

- 7674 [*Tolype notialis*](#) Franc., [small tolype](#); KGC
 7698 [*Malacosoma disstria*](#) Hbn., [forest tent caterpillar moth](#); KGC, HLN

Family SATURNIIDAE - [Giant Silkworm and Royal Moths](#)

Subfamily Citheroniinae

- 7704 [*Eacles imperialis*](#) (Drury), [imperial moth](#); KGC

Subfamily Hemileucinae

- 7746 [*Automeris io*](#) (F.), [io moth](#); KGC

Subfamily Satoriinae

- 7757 [*Antheraea polyphemus*](#) (Cram.), [Polyphemus moth](#); KGC
 7758 [*Actias luna*](#) (L.), [luna moth](#); KGC

SUPERFAMILY SPHINGOIDEA

Family SPHINGIDAE - [Sphinx or Hawk Moths](#)

Subfamily Sphinginae

- 7786 [*Ceratomia amyntor*](#) (Geyer), [elm sphinx](#); KGC
 7787 [*Ceratomia undulosa*](#) (Wlk.), [waved sphinx](#); KGC
 7816 [*Lapara coniferarum*](#) (J.E. Smith), [pine sphinx](#); KGC, HLN
 7824 [*Paonias excaecatus*](#) (J.E. Smith), [blinded sphinx](#); KGC
 7827 [*Laothoe juglandis*](#) (J.E. Smith), [walnut sphinx](#); KGC

Subfamily Macroglossinae

- 7885 [*Darapsa myron*](#) (Cram.), [hog sphinx](#); KGC

SUPERFAMILY NOCTUOIDEA

Family [NOTODONTIDAE](#) - [Prominents](#)

- 7904 [*Datana drexelii*](#) Hy. Edw., [Drexel's datana](#); KGC



Ecliptopera atricolorata (Grote & Robinson, 1867), dark-banded geometer moth. Photo by Carol Wolf (TN).



Eubaphe mendica (Walker, 1854), beggar moth. Photo by Carol Wolf (TN).



Automeris io (Fabricius, 1775) io moth, ♀. Photo by Carol Wolf (TN).



Antheraea polyphemus (Cramer, 1776), Polyphemus moth, ♂. Photo by Carol Wolf (TN).

- 7906 [*Datana contracta*](#) Wlk., [contracted datana](#); KGC
 7917 [*Hyperaeschra georgica*](#) (H.-S.), [Georgian prominent](#); KGC, HLN
 7957 [*Dasylophia anquina*](#) (J.E. Smith), [black-spotted prominent](#); KGC, HLN
 7975 [*Macrurocampa marthesia*](#) (Cram.), [mottled prominent](#); KGC

Family ARCTIIDAE - [Tiger, Lichen and Wasp Moths](#)

Subfamily Lithosiinae

- 8045.1 [*Crambidia pallida*](#) Pack., [pale lichen moth](#); KGC
 8067 [*Cisthene plumbea*](#) Stretch, [lead-colored lichen moth](#); KGC, HLN
 8089 [*Hypoprepia miniata*](#) (Kby.), [scarlet-winged lichen moth](#); KGC, HLN

Subfamily Arctiinae

- 8111 [*Haploa lecontei*](#) (Guer. Menerville), [Leconte's haploa](#); KGC
 8129 [*Pyrrharcia isabella*](#) (J.E. Smith), [Isabella tiger moth](#); KGC, HLN
 8134 [*Spilosoma congrua*](#) Wlk., [agreeable tiger moth](#); KGC, HLN
 8137 [*Spilosoma virginica*](#) (F.), [Virginian tiger moth](#); KGC, HLN
 8140 [*Hyphantria cunea*](#) (Drury), [fall webworm moth](#); KGC, HLN
 8203 [*Halysidota tessellaris*](#) (J.E. Smith), [banded tussock moth](#); KGC
 8211 [*Lophocampa caryae*](#) Harr., [hickory tussock moth](#); KGC
 8230 [*Cycnia tenera*](#) Hbn., [delicate cycnia](#); KGC, HLN

Family NOCTUIDAE - [Owlet or Noctuid Moths](#)

Subfamily Herminiinae

- 8353 [*Zanclognatha ochreipennis*](#) (Grt.), [wavy-lined zanclognatha](#); KGC
 8381 [*Renia discoloralis*](#) Gn., [discolored renia](#); KGC, HLN

Subfamily Hypeninae

- 8442 [*Bomolocha baltimoralis*](#) (Gn.), [baltimore bomolocha](#); KGC, HLN
 8445 [*Bomolocha abalienalis*](#) (Wlk.), [white-lined bomolocha](#); KGC, HLN
 8446 [*Bomolocha deceptalis*](#) (Wlk.), [deceptive bomolocha](#); KGC, HLN
 8447 [*Bomolocha madefactalis*](#) (Gn.), [gray-edged bomolocha](#); KGC
 8465 [*Plathypena scabra*](#) (F.), [green cloverworm moth](#); KGC

Subfamily Catocalinae

- 8514 [*Scolecocampa liburna*](#) (Gey.), [dead-wood borer moth](#); KGC
 8525 [*Phyprosopus callitrichoides*](#) (Grt.), [curve-lined owlet](#); KGC, HLN
 8695 [*Zale undularis*](#) (Drury), [black zale](#); KGC
 8704 [*Zale helata*](#) (Smith), [brown-spotted zale](#); KGC, HLN
 8707 [*Zale metatoides*](#) McD., [washed-out zale](#); KGC, HLN
 8719 [*Euparthenos nubilis*](#) (Hbn.), [locust underwing](#); KGC
 8721 [*Allothia elonympha*](#) (Hbn.), [false underwing](#); KGC
 8847 [*Catocala gracilis*](#) Edw., [graceful underwing](#); KGC, HLN
 8867 [*Catocala blandula*](#) Hulst, [charming underwing](#); KGC, HLN

Subfamily Plusiinae

- 8924 [*Anagrapha falcifera*](#) (Kby.), [celery looper moth](#); KGC, HLN

Subfamily Sarrothripinae

- 8973 [*Baileya australis*](#) (Grote), [small baileya](#); KGC, HLN

Subfamily Acontiinae

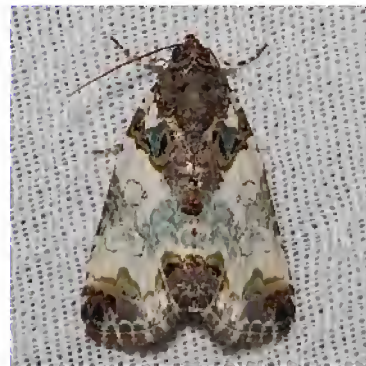
- 9062 [*Cerma cerintha*](#) (Tr.), [tufted bird-dropping moth](#); KGC
 9065 [*Leuconycta diphteroides*](#) (Gn.), [green leuconycta](#); KGC, HLN



Hypoprepia miniata (Kirby, 1837), scarlet-winged lichen moth. Photo by Carol Wolf (TN).



Pyrrharcia isabella (J.E. Smith, 1797), Isabella tiger moth. Photo by Carol Wolf (TN).



Cerma cerintha (Treitschke, 1826), tufted bird-dropping moth. Photo by Carol Wolf (TN).

Subfamily Pantheinae

- 9189 [*Charadra deridens*](#) (Gn.), [the laugher](#); KGC, HLN

Subfamily Acronictinae

- 9200 [*Acronicta americana*](#) (Harr.), [American dagger moth](#); KGC
9207 [*Acronicta innotata*](#) Gn., [unmarked dagger moth](#); KGC
9285 [*Polygrammate hebraeicum*](#) Hbn., [the Hebrew](#); KGC

Subfamily Amphipyriinae

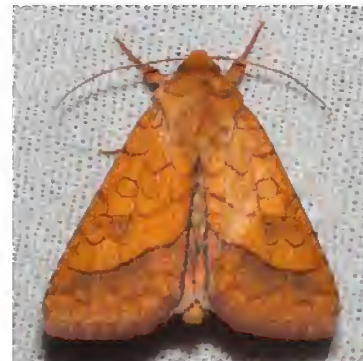
- 9664 [*Balsa labecula*](#) (Grt.), [white-blotched balsa](#); KGC
9678 [*Elaphria versicolor*](#) (Grt.), [variegated midget](#); KGC, HLN
9684 [*Elaphria grata*](#) Hbn., [grateful midget](#); KGC, HLN
9688 [*Galqula partita*](#) Gn., [the wedgling](#); KGC, HLN
9696 [*Condica vecors*](#) (Gn.), [dusky groundling](#); KGC, HLN
10567 [*Ulolonche culea*](#) (Gn.), [sheathed Quaker](#); KGC, HLN

Subfamily Noctuinae

- 10663 [*Agrotis ipsilon*](#) (Hufn.), [ipsilon dart](#); KGC, HLN

Subfamily Heliothinae

- 11063 [*Pyrrhia cilisca*](#) Lafontaine & Mikkola, [bordered sawlow](#); KGC, HLN



Pyrrhia cilisca Lafontaine & Mikkola, 1996, bordered sawlow moth. Photo by Carol Wolf (TN).

DISCUSSION

There are many localities in the state of Kentucky that are in need of [insect survey work](#). As evident from this study, in a short period of time several new locality and or county records can be obtained. This study added 116 species to the [Kingdom Come State Park](#) moth list, and 58 species to the Harlan County moth list. Hopefully in the future more species can be identified from the park and the moth species list will continue to grow.

ACKNOWLEDGMENTS

I would like to thank Rick Fuller and all of the other folks at [Kingdom Come State Park](#) for making my collecting easier. Also, thanks to Carey Tichenor and the [Kentucky Department of Parks](#) for granting the collecting permit.

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Paul Florence is an Associate Professor of Biology at [Jefferson Community & Technical College](#). He worked on habitat preferences of dragonflies at [Bernheim Forest](#) for his MS thesis research at the [University of Louisville Biology Department](#) and is the current Invertebrate Coordinator for KSNH.

CHAPTER NEWS

Falls of the Ohio Chapter Events (see front cover for regular meeting times and place, field trip times may be found below or are to be determined. Contact Chapter President **Chris Bidwell** at (502) 896-4834 or via email at:

mabteacher1@yahoo.com for more information. You can contact the Photo Contest Coordinator Susan Wilson via email at (susanfltrn@yahoo.com).

2011 Dates	Event/Speaker or Leader	Topic / Outing	Photo Contest Topic
April 21	Wildflowers - Wally Roberts	April 23 rd – Patoka Lake trip at the Connard's Property	Shapes In Clouds
May 19	TBD	TBD	Baby Critters
June 16	TBD	June 18 th Canoe Trip – 14 mile creek	Wildflowers
July	Summer Picnic	Jefferson County Memorial Forest	
September 15	TBD	TBD	Nature Nuts
October 20	Waterfalls - Tom Barnes	TBD	Waterfalls
November 17	The History of Beargrass Creek - Tom Owen	TBD	Urban Mammals
December	Annual Dinner: at the Episcopal Home off Westport Road, Louisville, KY	Presentation TBD later.	The cumulative winners of the Falls of the Ohio Chapter year-long photo contests will be announced.

KENTUCKY NATURALISTS' CALENDAR

(added as space and time allow)

2011:

April 13, 2011: "T" is for Tree; A shared activity for preschool children, parents, grandparents or family members @ the Visitor Center at [The Arboretum](#), 500 Alumni Drive, Lexington, KY 40503 (10:00 a.m.). There are many ways to honor the addition of a family member. The Arboretum invites you and your child to plant a tree sapling and watch it grow as your family does. Come and expose your child to the wonders of nature and begin a lifelong appreciation of the natural world. Cost: \$2/ family. For more information, or to to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

April 15-17, 2011: Kentucky Society of Natural History 2009 Spring Meeting @ [Carter Caves State Resort Park](#), 344 Caveland Drive, Olive Hill, KY 41164, (606) 286-4411. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

April 15-17, 2011: Wildflower Weekend @ [Pine Mountain Settlement School](#), 36 Highway 510, Pine Mountain, KY 40810 (6:00 p.m. Friday to lunch Sunday). In mid-to-late April, the Settlement School property is a wildflower wonderland, with nearly 100 species of spring wildflowers. Details of guest speakers and special programming will be announced at a later date. Various rates apply. Contact the Pine Mountain Settlement School at 606-558-3571 or 606-558-3542 for details. You can also visit their website at <http://www.pinemountainsettlementschool.com/>.

April 18, 2011: "Growing Up WILD" Training Workshop @ the Visitor Center at [The Arboretum](#), 500 Alumni Drive, Lexington, KY 40503 (9 a.m. – 1 p.m.). The nationally renowned, environmental education program, Project WILD, developed an early childhood curriculum: Growing Up WILD. Join us in an interactive workshop to explore the field-tested, hands-on activities which encourage children to explore, discover, and understand their natural surroundings. Registration fee includes Growing up WILD curriculum guide. Cost: \$20 (Volunteers- \$15). For more information, or to to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

April 19, 2011: Riparian Zone Restoration @ the Visitor Center at [The Arboretum](#), 500 Alumni Drive, Lexington, KY 40503 (10 a.m.-12 p.m.). Instructors: Carmen Agouridis, Assistant Professor of Biosystems and Agricultural Engineering; Chris Barton, Associate Professor of Forestry, and Amanda Gumbert, Extension Specialist/Water Quality Riparian buffers offer a number of ecosystems benefits related to water quality, streambank stabilization, and habitat. Riparian buffers slow and capture runoff, which can improve water quality by trapping and filtering pollutants such as sediment, nutrients, and pesticides. We'll cover the main

concepts behind the benefits of riparian buffers, removal of invasive plants, selection of native plants & planting/maintenance. FREE. For more information or to to pre-register call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

April 26, 2011: Plant a Wetland @ the Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (10 a.m.). Join Arboretum staff for a hands-on workshop highlighting plants suitable for a wetland area. Instruction will be given in proper techniques for planting and you will have the opportunity to assist with planting the soon to be open Kentucky Children's Garden. FREE. For more information, or to to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

April 28 - May 1, 2011: 4th Annual [Ohio Valley Birding Festival](http://www.OhioValleyBirdingFestival.org) @ various times and locations throughout the Evansville, Indiana region. The Evansville Audubon Society will feature four full days of hikes, lectures, workshops and other activities designed to introduce people of all ages to the fascinating world of birds and birding. Activities include bird hikes with some of the area's best guides, bird banding workshop, owl prowl, identification workshops, creating backyard habitat, bird related crafts, games and activities for children and their families. There will be something offered each day for every level of birder, many activities will be free to the public. The keynote speaker for this year's Festival will be Dr. Eldon Greij, founding editor of Birder's World magazine. Visit <http://www.OhioValleyBirdingFestival.org> for details, including the complete Festival schedule or call Wesselman Woods Nature Preserve at (812) 479-0771.

April 29-May 1, 2011: Kentucky Native Plant Society's [Wildflower Weekend](#) @ [Natural Bridge State Resort Park](#), 2135 Natural Bridge Road, Slade, KY 40376-9701. The Kentucky Native Plant Society's 25th annual Wildflower Weekend features field trips, botanists, speakers, and more! Wildflower Weekend brings together some of Kentucky's leading plant professionals and joins them with plant and outdoor enthusiasts that are looking to find out more about Kentucky's diversity of plants and their ecology. Registration fee upon arrival. A detailed agenda with specific fieldtrips/leaders will be available upon request on or after April 11th by contacting park naturalist Brian Gasdorf at brian.gasdorf@ky.gov or (606) 663-2214.

April 29-May 1, 2011: Kentucky Ornithological Society (KOS) Annual Spring Meeting @ Barren River State Resort Park. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.eku.edu/kos/default.htm>.

April 30, 2011: 20th Annual Arbor Day – “Re-leaf: Renewing Our Community Forest” @ the Visitor Center at [The Arboretum](#), 500 Alumni Drive, Lexington, KY 40503 (10 a.m.-2 p.m.). Celebrate Arbor Day at The Arboretum with a commitment to maintaining and renewing the trees that make our community healthy and beautiful. Along with the reading of the Arbor Day Proclamation by Mayor Jim Gray, and planting the Arbor Day tree, there will be a “Tree Birthday” celebration including cake. Exhibits under the tent, and fun activities for all ages will be ongoing. Join guided tree walks at 11am and 1pm. Expect to catch sight of Smokey Bear and a new friend, Louie the Lightning Bug. Refreshments and t-shirts will be available for purchase and tree seedlings will be free as long as they last. FREE. For more information, or to to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

May 06-08, 2011: Black Mountain Weekend @ [Pine Mountain Settlement School](#), 36 Highway 510, Pine Mountain, KY 40810 (6:00 p.m. Friday to lunch Sunday). Wildflower lovers will enjoy visiting Black Mountain, the highest point in Kentucky and habitat to rare species of wildflowers and birds. Wildflower species exclusive to Black Mountain are: Painted Trillium, Roseate Twisted Stalk and Red-Berried Elder. Bird species include Canada warbler, black-throated blue warbler, veery thrush, and rose-breasted grosbeak. Saturday's activities will also include hikes at Kingdom Come State Park and Bad Branch State Nature Preserve. Details of guest speakers and special programming will be announced at a later date. Various rates apply. Contact the Pine Mountain Settlement School at 606-558-3571 or 606-558-3542 for details. You can also visit their website at <http://www.pinemountainsettlementschool.com/>.

May 28, 2011: Photography Workshop: Focus on Flowers @ Education Center Classroom and Grounds at [Bernheim Arboretum & Research Forest](#), State Highway 245, P.O. Box 130, Clermont, KY 40110 (6:00 AM - 7:00 PM). Focus on Flowers: Mastering Macro Photography of the Architecture of Flowers with professional photographer Allen Rokach. Timed to take advantage of Bernheim's beautiful spring bloom, this workshop puts you into direct communication with one of the world's most acclaimed nature photographers in Kentucky's most beautiful spring landscape. In this two-day intensive workshop targeting advanced beginner to serious photographers you will learn techniques to capture the essence of floral macro-photography with your digital camera. The workshop will also include training in “after capture” photo editing techniques. The workshop will culminate with a presentation and review of your photographs as well as a discussion on after-capture techniques that can improve your final image. Fee: \$270

members; \$300 non-members; registration deadline Friday, May 13. For more information call (502) 955-8512, email them at nature@bernheim.org, or visit their website at <http://www.bernheim.org/>.

June 08-12, 2011: In the Footsteps of Lucy Braun @ Pine Mountain Settlement School, 36 Highway 510, Pine Mountain, KY 40810. This four-day forest study workshop is named in honor of one of the first and foremost conservationists of the 20th century, E. Lucy Braun. Dr. Lucy, as she was called by her colleagues, devoted her life to the study of plants and to conservation campaigns to save wilderness areas and other natural sites. The four-day workshop will combine field trips, lectures, and slide presentations in the study of forest types found in Eastern Kentucky. The four-day workshop will combine field trips, lectures, and slide presentations in the study of forest types found in Eastern Kentucky. Daily field trips will include four- to eight-mile hikes. The workshop is geared toward adults. Various fees apply. Contact the Pine Mountain Settlement School at 606-558-3571 or 606-558-3542 for details. You can also visit their website at <http://www.pinemountainsettlementschool.com/>.

August 17-21, 2011: In the Footsteps of Lucy Braun @ Pine Mountain Settlement School, 36 Highway 510, Pine Mountain, KY 40810. This four-day forest study workshop is named in honor of one of the first and foremost conservationists of the 20th century, E. Lucy Braun. Dr. Lucy, as she was called by her colleagues, devoted her life to the study of plants and to conservation campaigns to save wilderness areas and other natural sites. The four-day workshop will combine field trips, lectures, and slide presentations in the study of forest types found in Eastern Kentucky. The four-day workshop will combine field trips, lectures, and slide presentations in the study of forest types found in Eastern Kentucky. Daily field trips will include four- to eight-mile hikes. The workshop is geared toward adults. Various fees apply. Contact the Pine Mountain Settlement School at 606-558-3571 or 606-558-3542 for details. You can also visit their website at <http://www.pinemountainsettlementschool.com/>.

September 16-17, 2011: The Kentucky Association for Environmental Education's 35th Annual Conference @ the Brown Hotel, 335 West Broadway, Louisville, Kentucky 40202. The theme for the 2011 conference is "Environmental Education: Everywhere for Everyone." While environmental education is at home in the forests and fields, it also has a well-established foothold in the cities. Urban gardening, green building design, and cleaner transportation are all considerations in population centers. Wherever people live, there is a need for environmental education. To be successful, we must attract a diverse group of people from different ages, genders, ethnicities, and economic backgrounds. For more information, contact KAEE at PO Box 17494, Louisville, KY 40217-0494 or visit the conference website at <http://kaee.org/conference/>. For information about the Brown Hotel, contact them at by phone at (502) 583-1234 or (888) 888-5252.

September 30-October 2, 2011: Kentucky Society of Natural History 2011 Fall Meeting @ Cumberland Falls State Resort Park. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

September 30-October 2, 2011: The Kentucky Ornithological Society's Fall Meeting @ Pine Mountain State Resort Park, Henderson, KY. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.eku.edu/kos/birding.htm>.

October 21-23, 2011: Fall Color Weekend @ Pine Mountain Settlement School, 36 Highway 510, Pine Mountain, KY 40810. Fall Color Weekend at Pine Mountain Settlement School offers activities for people of all ages. Features include hikes, multi-media presentations, and the opportunity to enjoy some of Kentucky's most beautiful natural areas and stunning autumn foliage. Fee based. Contact the Pine Mountain Settlement School at 606-558-3571 or 606-558-3542 for details. You can also visit their website at <http://www.pinemountainsettlementschool.com/>.

2012:

April 13-15, 2012: Kentucky Society of Natural History 2012 Spring Meeting @ Shepherdsville Area. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

April 27-29, 2012: The Kentucky Ornithological Society's Spring Meeting @ Kentucky Dam Village State Resort Park, Gilbertsville, KY. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.eku.edu/kos/birding.htm>.

October 12-14 or 19-21, 2012: Kentucky Society of Natural History 2012 Fall Meeting @ Pine Mountain State Resort Park. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

The mission of the **Kentucky Society of Natural History (KSNH)** is to actively promote study and interest in Kentucky's rich natural heritage throughout the Commonwealth. Members are typically interested in a broad spectrum of natural sciences and related fields. Among the more prominent activities of the KSNH, are the annual spring and fall Conferences, selection of a "Naturalist of the Year", nature photography contests, research grants, and a variety of knowledgeable speakers and field trips. We invite anyone who shares our interests to **join us**.

For membership information or to submit dues please contact:

Kentucky Society of Natural History, 3701 Fenholt Road, Louisville, KY 40218,

or visit our website <<http://www.ksnh.org>> for the membership form. Membership dues are:
Individual \$15, Family \$25, Full Time Student \$7.50, Lifetime: \$300.

The Kentucky Society of Natural History is an official 501(c) (3) tax-exempt nonprofit organization which was formed in 1939, and incorporated in 1943 in Louisville, Kentucky. All contributions to THE KENTUCKY SOCIETY OF NATURAL HISTORY are tax-deductible to the full extent of federal and state income tax laws.

Published quarterly, The [Kentucky Naturalist News](#) is the official newsletter of KSNH. Unsolicited contributions are encouraged. Please send articles to: **Barry Nichols, KNN Editor, P. O. Box 21182, Louisville, KY 40221.** You can also email newsletter submissions by sending them to kyfauna@iglou.com.

Kentucky Naturalist News Deadlines & Schedule:

<u>Issue</u>	<u>Deadline</u>	<u>Tentative Publish Date</u>
Summer Issue	May 1, 2011	June 1, 2011
Fall Issue	August 1, 2011	September 1, 2011
Winter Issue	November 1, 2011	December 1, 2011
Spring Issue	February 1, 2011	March 1, 2012

For submissions, plan on 0.5-inch margins, 10 pt Arial or Calibri font, and about 2 photos per page. Please leave the photo images in full-size and do not optimize them. Please cite references. To assist, you may use: <http://www.lib.ncsu.edu/lobo2/citationbuilder/citationbuilder.php>.



**Kentucky Society of Natural History
3701 Fenholt Road,
Louisville, Kentucky 40218**

Formed 1939,



Incorporated 1943

Kentucky Naturalist News

Official Newsletter of the Kentucky Society of Natural History

Volume 69, Number 2, Summer 2011

Website: <http://www.ksnh.org>

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Vice Pres.: Jeff Foster (jfoster@sscc.edu)

Secretary:

Treasurer: Pat Meyer (treasurer@ksnh.org)

Editor: Barry Nichols (kyfauna@iglou.com)

Past Pres.: Joe Settles (joe.settles@ekpc.coop)

webmaster: Dave Luzader (webmaster@ksnh.org)

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Mammalogy: Mark Gumbert

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Naturalist of the Year: Wally Roberts/Joe Settles

Photography: Susan Wilson (susanfltrn@yahoo.com)

Publicity:

Youth Activities:

Board Members at Large

Berl Meyer (geology@ksnh.org)

Affiliated Chapters

Arches of the Cumberland Chapter (Slade) meets informally, call President Dell Sasser for details, 606-666-7521 x73559, or (606) 233-8938, or via email (dell.sasser@kctcs.edu)

Falls of the Ohio Chapter (Louisville), 9109 Hawthorne Pointe Drive, Louisville, KY 40272, **meets every 3rd Thursday** of each month except Jan, Jul, Aug, & Dec at 7:00 PM at the Louisville Nature Center, 3745 Illinois Ave, Louisville, 40213. Call President Chris Bidwell at (502) 458-1328, or via email (mabteacher1@yahoo.com).

Wilderness Trail Chapter (Pineville) meets the first Thursday of each month, March through December, at 7:00 p.m., generally at Pine Mountain State Resort Park in the Ray Harm Room, 1050 State Park Road Pineville, KY 40977-0610 (800-325-1712). Call President Tom Toole at (606) 248-3078, or via email (tom.tdtoole@gmail.com).



A *Sciurus carolinensis* Gmelin, 1788 eastern gray squirrel eating a nut in Valley Station, Jefferson County, KY in May, 2011. Photo by Barry Nichols, 2011, Nikon Coolpix P100.

EDITOR'S NOTES

Anissa Florence has left her position of KSNH Treasurer. We thank her for her service to the organization. Pat Meyer has now assumed the treasurer's position until the fall elections are held at our 2011 Cumberland Falls Conference. Dues may be sent to her at **10707 Coogle Lane, Fairdale, KY 40118**. For questions you may email her at treasurer@ksnh.org.

Some early information about the KSNH Fall 2011 meeting at Cumberland Falls State Resort Park will be available in the next newsletter. Stay tuned!

Members are encouraged to show interest in any of the several open board positions (see the front page sidebar) by sending an email to President [Zeb Weese](#). Alternatively, you can send postal mail to the address above. The term would run until the end of 2011. Elections for the full 2012-2013 term will be held at the [2011 Fall Conference at Cumberland Falls State Resort Park](#). Please express your interest to Zeb for the upcoming term as well.

We now have a yahoo discussion group for KSNH members. To access it, either go to the group page at <http://tech.groups.yahoo.com/group/KSNH/>. We can not sign up anyone on our own. Only you have the ability to sign up while on the page or by sending an email to me and I'll send out an invite. I have to do it this way because it is a closed group. When you get the email you can click to join the group.

You decide whether you just want to read messages online, have them sent to your email individually, or as a daily digest. You can upload photos to a folder of your choosing, create natural history links, and/or post documents.

Odwalla (the drink manufacturer) is planting trees in the US. This is free for you. You can vote (one email=one vote) on their "Plant A Tree" webpage at <http://www.odwalla.com/plantatree/>, or you can also vote via Facebook by [clicking here](#). You basically click on the state where you want your tree planted. The program runs from May 30, 2011 to September 1, 2011 or until all trees (80,000) are gone. These trees will be planted in [state parks](#). At the time of writing, Kentucky had the 4th largest number of trees being planted with 3,996.

We've been getting the word out for dues renewals and new [members](#). Also, please remember that you can save on postage by [paying your dues](#), donating to various KSNH efforts like [grants](#), and/or paying for merchandise by going to the KSNH website (linked all over the newsletter) to make [paypal payments](#). Efforts are also underway to allow [Google Checkout](#) payments soon.

Please note: The deadline for submissions for the next issue (KNN Fall 2011) is [August 1, 2011](#). –barry

BIRD WALK REPORT FROM THE 2011 KENTUCKY SOCIETY OF NATURAL HISTORY

SPRING MEETING AT CARTER CAVES STATE RESORT PARK

by Evelyn Morgan

The bird walk for the Kentucky Society of Natural History's [2011 Spring Meeting at Carter Caves State Resort Park](#) on Sunday, April 16 was greeted by some hearty souls. The morning was crisp and cool, but we did see some good birds. Most noteworthy was the number of [Melanerpes erythrocephalus](#) (Linnaeus, 1758) or [red headed woodpeckers](#). We saw at least 6, including one guarding a hole in scrubby looking oak near the tennis court. The [red headed](#) were zipping around in all directions, calling and making quite a show. We also saw [Melanerpes carolinus](#) (Linnaeus, 1758) ([red-bellied woodpeckers](#)), [Dryocopus pileatus](#) (Linnaeus, 1758) ([pileated woodpeckers](#)), and [Picoides pubescens](#) (Linnaeus, 1766) ([downy woodpeckers](#)). The [pileated woodpeckers](#) appeared to be housekeeping, going in and out of a large hole in an oak tree.

Warblers were slow, but we did get good looks at a [Dendroica dominica](#) (Linnaeus, 1776) ([yellow-throated warbler](#)), [Dendroica pinus](#) (Wilson, 1811) ([pine warbler](#)), and [Dendroica coronata](#) (Linnaeus, 1766) ([yellow-rumped warbler](#)). We heard [Seiurus aurocapilla](#) (Linnaeus, 1766) ([ovenbird](#)), [Dendroica virens](#) (Gmelin, 1789) ([black-throated green warbler](#)), [Polioptila caerulea](#) (Linnaeus, 1766) ([blue-gray gnatcatcher](#)), and [Vireo olivaceus](#) (Linnaeus, 1766) ([red-eyed vireo](#)).

The group got a good look at a [Hylocichla mustelina](#) (Gmelin, 1789) ([wood thrush](#)). A very pretty bird, it did not sing, but provided us with a good open view.

We saw several female [*Carpodacus purpureus*](#) (Gmelin, 1789) ([purple finch](#)) and saw one male [purple finch](#). Late migrants included a few [*Spinus pinus*](#) (Wilson, 1810) ([pine siskins](#)). All the regulars you would expect to find, ([Northern cardinal](#)), [*Baeolophus bicolor*](#) (Linnaeus, 1766) ([tufted titmouse](#)), [*Poecile carolinensis*](#) (Audubon, 1834) ([Carolina chickadee](#)) and [*Sitta carolinensis*](#) - Latham, 1790 ([white-breasted nuthatch](#)) were also seen.

It was a great day! Thanks to all that went with me.

Evelyn Morgan is an avid birder and works for the Daniel Boone National Forest. She is also an active member of the East Kentucky Bird Club.

NOTES FROM THE NATURE NUT:
SHAWNEE STATE PARK AND FOREST REVISITED
 by W. H. (Wally) Roberts



In April of 2010, the [Kentucky Society of Natural History](#) held its Spring Conference at [Shawnee State Park and Forest](#) near [Portsmouth, Ohio](#), a natural area commonly referred to as "[The Edge of Appalachia](#)". All members who attended were pleased to find such wonderful [biodiversity](#), [cultural history](#), [natural beauty](#), and fabulous accommodations.

Karen and I were so impressed that we decided to return during the third week of April this year. We made our reservations for five days and four nights, but due to severe flooding on the [Ohio River](#), we were forced to reschedule to the first week of May. Meanwhile, our friends and fellow KSNH members, Tom and Doris Mattingly, returned home from wintering in Florida and decided to accompany us.

I feared that we might be late for the spring bloom and migration, but was surprised to find [Shawnee](#) ten to fourteen days behind the Louisville area. We were able to tally over 100 [wildflowers, shrubs, and trees](#) in bloom and identified 92 species of [birds](#).

During last year's Spring Conference, time did not allow us to [visit several areas](#) recommended by Jeff and Becky Foster, local residents and long-time KSNH members. This trip, we had the time to visit the Amish Colonies near West Union and the Wheat Ridge Road areas, where we ate great food and shopped for handmade Amish crafts from furniture to [bird feeders](#).

We, also, had time to visit the Moyer Vineyards and Restaurant downstream from [Shawnee](#) toward Maysville, and the historic Firehouse Pub and Brewery in nearby downtown [Portsmouth, Ohio](#). While in [Portsmouth](#), we visited the [historic murals](#) painted on the downtown [Portsmouth floodwall](#). These [paintings](#) are truly beautiful and amazing. I would highly recommend visiting them if you are ever near the area.

While naturing along the many miles of well-maintained forest service roads, we discovered the largest stand of [Lonicera sempervirens](#) L., 1753 ([trumpet honeysuckle](#)) that I have ever seen.

[Trumpet honeysuckle](#), also called [coral honeysuckle](#), is a beautiful species native to the eastern United States, with [bright red tubular flowers](#). This evergreen twining shrubby vine grows to several meters high through shrubs and young trees. [Trumpet Honeysuckle](#) is pollinated by [hummingbirds](#) and [insects](#). It is, also, a common ornamental plant grown

in gardens and is nationally listed as a top ten plant to attract [Archilochus colubris](#) (Linnaeus, 1758) [ruby-throated hummingbirds](#).

This large patch of [trumpet honeysuckle](#) was about 75 yards long on the east side of Shawnee Forest Service Road #9. To reach this site, cross the Ohio River at Maysville and proceed east on U.S. 52 to Friendship, Ohio, and turn left on Ohio 125 at the Shawnee Park entrance sign. Proceed northwest approximately three miles and turn left on Shawnee Forest Service Road #1, also known as Pond Lick Run. Travel west less than one mile and turn left on Shawnee Forest Service Road #9. The patch of honeysuckle is about 150 yards on your left. Remember that blooming times will vary, but early to mid May should offer you an opportunity to view and photograph this display of beautiful red honeysuckle.

Karen and I are looking forward to the [2011 KSNH Fall Conference](#) on September 30, October 1 and 2, at [Cumberland Falls State Resort Park](#) and hope to see you there.

Always remember that we have only one natural world, so there is nothing nuts about loving it.

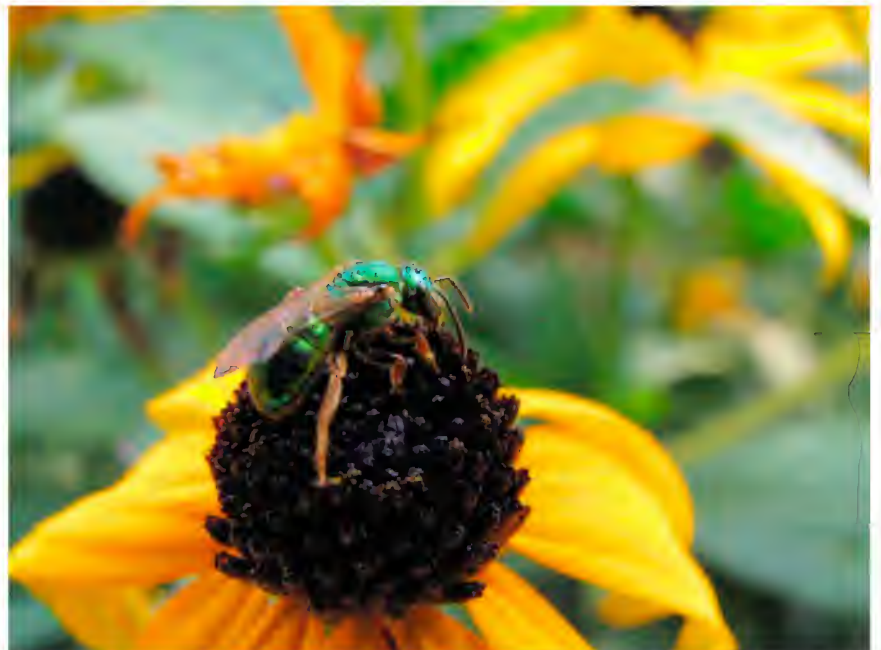
*Wally Roberts was [Kentucky Naturalist of the Year](#) 2002. He is a long-time biology instructor, interpretive naturalist, and nature photographer. He graduated with a BS in Biology from [Morehead State University](#), and M.Ed. in Biological Education from the [University of Louisville](#). He's been President of KSNH (three times), former President of the Falls of the Ohio Chapter, and past President of the Board of the [Louisville Nature Center](#). He's currently the **Grant Coordinator** for KSNH.*

THE IMPORTANCE OF BEES

by Athena Rayne Anderson

THE IMPORTANCE OF INSECT POLLINATION

The importance of insects, especially [bees](#), could not be more obvious than when considered in the context of [global food supply](#). [Gordon Allen-Wardell and colleagues](#) stated in a 1998 article in the journal [Conservation Biology](#) that “the [management](#) and protection of [wild pollinators](#) is an issue of paramount importance to our [food supply](#) system.” The authors reported that many [crop failures worldwide](#) in the last several decades resulted from scarcity of [wild pollinators](#). [California almond orchards](#) suffered a decline in 1995 due to weather and [pollinator loss](#). The cashew nut crop harvest in north [Borneo](#) is consistently suboptimal because the species is native to [Brazil](#) and has no [native pollinator](#) in the Old World tropics. Unfortunately, the possible [effects of pollinator declines](#) on the [human food supply](#) are critically understudied.



A female bee in the [Tribe Augochlorini](#) ([Order Hymenoptera](#), [Family Halictidae](#) - [halictid bees](#), [sweat bees](#)) feeding on [Rudbeckia hirta](#) L. 1753 ([black-eyed Susan](#)). Photo by Athena Rayne Anderson, 2007, Canon Powershot S2 IS. [John S. Ascher](#) ([American Museum of Natural History Bee Database Project](#)) identified the bee.



Bombus sp. (Order Hymenoptera, Family Apidae -- [bumble bees](#)) feeding on [flower](#). Photo by Athena Rayne Anderson, 2011, Canon Powershot S2 IS.

Until 1990 it was believed that only a handful of plants feed the [world](#), but a paper published that year in [Conservation Biology](#) by Robert and Christine Prescott-Allen demonstrates otherwise. By examining national food supply data the authors discovered that more than 100 [plant](#) species provide 90% of the [food](#) for 146 countries [worldwide](#). The authors point out that this new information shows the importance of [conserving plant species](#) and [genetic diversity](#) if we are to safeguard our [food supply](#).

More than 70% of the plants listed by the Prescott-Allens as crucial to feeding the [world](#) are [pollinated by insects](#). The authors have also documented 60 crop plants crucial to the [North American economy](#) and their level of dependence on [insect pollinators](#). They found that seven crops ([cashew](#), [squash](#), [mango](#), [cardamom](#), [cacao](#), [cranberry](#), and [highbush blueberry](#)), worth \$1.25

billion per year, are dependent on [insect pollination](#). The importance of insects to [food plants](#) is supported by other sources as well. [Dave Roubik](#), a tropical [bee](#) researcher, estimates that 800 species of cultivated plants [worldwide](#) require [insect pollination](#). Of these species 19% are [pollinated by flies](#), 5% by [wasps](#), 5% by [beetles](#), 4% by [butterflies](#) and [moths](#)... and 73% are [pollinated](#) by [bees](#) alone.

BEES AS POLLINATORS

BEE NATURAL HISTORY-- Several characteristics of [bee anatomy](#) and [life history](#) make them ideal as [pollinators](#). First, [bees](#) have fuzzy bodies with finely- branched hairs that increase the surface area to which pollen can cling. Second, many [bee](#) species have [specialized segments](#) on their [bodies](#) for collecting pollen. For example, some [bees](#) have a [corbiculum](#), a modified section on each [hind leg](#), into which they [pack pollen](#). Other [bees](#) have specialized hairs on their hind legs or the underside of their [abdomens](#) in which they [store pollen](#) (called a [scopa](#)) . Third, [bees](#) obtain nutrition entirely from [pollen and nectar](#) in all their life stages, which makes them intimately linked to a flower's sexual cycle. Fourth, [bees](#) are members of the [Order Hymenoptera](#), a group estimated to contain one out of every ten animals on the planet. There are 25,000 [species of bees](#) currently described worldwide, and some researchers predict that there might be as many as 40,000 species living today. Approximately 3,500 species of [solitary bees](#) live in North America alone. Finally, fossils from [Petrified Forest National Park](#) in Arizona suggest that [bees](#) evolved around 220 million years ago, more than 100 million years



A female *Andrena* sp. (*A. nasoni*?) bee feeding on *Rosa* sp. (rose) flower. Photo by Athena Rayne Anderson, 2011, Canon Powershot S2 IS. [John S. Ascher \(American Museum of Natural History Bee Database Project\)](#) identified the bee.

before the [flowering plants](#). This indicates that the explosion in flowering [plant diversity](#) might have been the result of [co-evolution](#) between plants and [pollinating bees](#).

BENEFITS OF [BEE](#) POLLINATION-- Many self-fertile plants benefit from [cross-pollination](#) by [bees](#). A paper published in 1976 by R.B. Kozin described several crops that benefit from [cross-pollination](#) by [bees](#) in Russia. Among the plants studied were [red clover](#), [long-stemmed flax](#), and fodder bean, their yields increasing as a result of [bee pollination](#) by 400%, 48.8%, and 89%, respectively. Protein content, seed quality, and number of seed pods per plant also increased with [cross-pollination](#). Increases in fruit and seed yield and quality as a result of [bee pollination](#) have also been reported in [buckwheat](#), [sunflower](#), and [citrus](#) varieties.

In 2006, Sarah Greenleaf and [Claire Kremen](#) found that [SunGold tomatoes](#), a variety previously thought to be primarily self-pollinating, increased fruit yield as a result of [bee pollination](#). In fact, fruit production in this crop decreased when [pollinators](#) were prevented from visiting flowers, which indicates that [tomato](#) yield could be correlated with [bee abundance](#). Experiments with [canola](#) show similar benefits of [bee](#) visitation. Of particular interest is the discovery that [canola on organic farms](#) produced more seeds than that on [conventional or genetically modified farms](#), most likely due to a healthier [pollinator population](#) on the former.



[Bombus impatiens](#) Cresson, 1863 (common Eastern [bumble bee](#)) nest in [bird house](#) in Valley Station, KY. Photo by Barry Nichols, 2011, Nikon Coolpix P100.

The benefits of [bee pollination](#) translate directly into monetary figures. [Insect pollination in the UK](#), mostly by [honey bees](#) and [bumble bees](#), is [valued](#) yearly at £202 million. In the U.S., [bee pollination](#) has been linked to increased fruit size and number in [pears](#), [cranberries](#), and [blueberries](#), with a combined increase in revenue of more than \$4,100 per acre. [Alfalfa](#) is another important crop benefiting from [bee pollination](#), and [alfalfa](#)- derived products accounted for \$12 billion per year in 1990. [Alfalfa](#) hay feeds most of the livestock in the U.S., and is alone worth \$5 billion yearly.

[Bees](#) are important as [pollinators](#) for more than our [agricultural crops](#). It is estimated that [bees pollinate](#) 16% of the world's 250,000 flowering plant species. Given that this total includes water-, wind-, and animal-[pollinated plants](#), the importance of [bees](#) is underestimated by this figure. Interestingly, new research has found that not all [bees](#) are equal as



Apis mellifera Linnaeus, 1758 (**European honey bee**) feeding on *Solidago* sp. (one of the **goldenrods**). Photo by [Athena Rayne Anderson](#), 2007, Canon Powershot S2 IS.

pollinators. Some **bees** are extremely efficient **pollinators** of a small number of plants, while others are moderately efficient at **pollinating** a variety of plants. Until recently, most **pollinator research** focused on **honey bees** and they were thought to be the primary **pollinators** when they were present. We are only beginning to **understand** the importance of other **bees** as **pollinators** of our crops and **unmanaged plants**.

HONEY- MAKING BEES

HISTORICAL INTERACTIONS-- **Honey-making bees** are those which produce large stores of concentrated nectar in the form of honey as their primary food source. Humankind has been pilfering from honey-making **bees** for thousands of years. **Honey bees** figure prominently in the **mythology** of **cultures** as diverse as

the **San people** of the **Kalahari Desert** and societies from ancient Romania, India, and Brazil. **Beekeeping** was so important to the ancient Egyptians that they used a bee hieroglyph to represent all of Lower Egypt, where **honey** and **wax** were major economic products. **Egyptian beekeeping** was a model for **bee management** throughout the Mediterranean and influenced the societies of the ancient Greeks and Romans. **Langstroth's** 1852 invention of the removable hive frame changed **European beekeeping** from a **destructive honey harvest** to productive **colony management**. **Beekeeping** was economically important throughout Europe for **beeswax**, **honey**, and **honey wine (mead)**. In the **Americas**, the ancient **Mayas** maintained **hives** of *Melipona beecheii* Bennett, 1831 (**xunan-kab**) in a tier of **log colonies** protected by thatched roofs. They **valued** their **honey-making stingless bees** not only for their **honey** and wax, but also as **crop pollinators**.

EUROPEAN HONEY BEES IN NORTH AMERICA--

There are no honey-making (in appreciable quantity) **bees native** to North America, a fact which prompted settlers to import *Apis mellifera* Linnaeus, 1758 (**European honey bee**), to the United States as early as the 1600s. **Gloria DeGrandi-Hoffman** stated in a 2003 publication that "The **history of beekeeping in the United**



A female *Halictus ligatus* Say, 1837, (**sweat bee**) feeding on *Rudbeckia hirta* L. 1753 (**black-eyed Susan**) in Valley Station, KY. Photo by Barry Nichols, 2011, Nikon Coolpix P100. [John S. Ascher](#) ([American Museum of Natural History Bee Database Project](#)) identified the bee.

[States](#) is interwoven with the history of U.S. agriculture.” Although [honey bees](#) were brought to North America for their honey and wax, their [value](#) as [pollinators](#) has far surpassed their other contributions to our culture. [Stephen Buchman](#) and [Gary Nabhan](#) estimated in 1996 that the monetary worth of [honey bee](#) pollination services is 50 to 60 times greater than anything else gained from their [management](#). One estimate places the value of [pollination services](#) from [honey bees](#) in the U.S. at \$112 billion per year. In 1988 there were approximately 3.4 million managed [honey bee](#) hives in the U.S., maintained by hobbyists and professionals combined.

Sources predict that [honey bee](#) colony numbers will [decline](#) continually due to [Colony Collapse Disorder](#) and other pathogens, and it is becoming clear that [honey bees](#) can no longer be relied upon as our primary [agricultural pollinator](#). For instance, if [native bees](#) cannot be recruited to [pollinate alfalfa](#), a [decline](#) in [honey bee](#) colonies could result in a 70% loss in [alfalfa crops](#), costing U.S. [agriculture](#) about \$315 million per year. Taking all [crops](#) into account, a failure on our part to boost [native pollinator](#) populations to a level that could replace [honey bees](#) could result in an annual loss of \$5.7 billion. The message is clear: either we [conserve and promote](#) the [diversity](#) of our [native pollinator](#) populations, or our culture will be faced with a very expensive and uncertain future.

POLLEN BEES

[Bees](#) that do not make and store large quantities of [honey](#) are known as [pollen bees](#). Unfortunately, the majority of [bee research](#) in the last several decades has been devoted to [honey bees](#) and we are only recently learning even the basics of [pollen bee](#) life history. Although we have identified some [pollen bees](#) as highly beneficial for [crop pollination](#), the gaps in our knowledge of this [diverse group](#) are astounding.

In the case of some crops, [pollen bees](#) are essential for facilitating [pollination](#) because [honey bees](#) are incapable of doing so. Sometimes both [pollen-](#) and [honey bees](#) are able to [pollinate a crop](#) but research has found that the former is more reliable and efficient. The following sections detail the importance of several [pollen bee](#) species to crop production and pertinent management practices.

BUMBLE BEES-- [Bumble bees](#) (genus [Bombus](#)) are one of the few groups of [pollen bees](#) which can be [reared and managed](#) with relative ease. These [bees](#) have an [annual life cycle](#), with the [colony dying](#) before winter and only mated queens hibernating until spring. A [wild bumble bee queen](#) selects an abandoned rodent burrow or grass tussock as a [nest](#) site and begins a [colony](#) that could eventually contain several hundred members. The [workers](#) store small amounts of [honey](#) in tiny pots for use in inclement weather, but must obtain [pollen](#) and [nectar](#) almost daily to [survive](#). Because of this, they are often



[Bombus impatiens](#) Cresson, 1863 (common Eastern [bumble bee](#)) nest in bird house in Valley Station, KY. Photo by Barry Nichols, 2011, Nikon Coolpix P100.

active earlier in the year and in worse weather than [honey bees](#).

[Queens](#) can be encouraged to [nest in manmade structures](#) such as overturned garden flower pots or [nest boxes](#) designed for commercial purposes. [Bumble bees](#) are relatively easy to [manage](#), since their hibernation can be interrupted and [colony establishment](#) can be induced to coincide with crop flowering year-round. In contrast to [honey bees](#), [bumble bees](#) have long tongues that make them better [pollinators](#) of flowers with long corollas, such as broad bean and red clover.

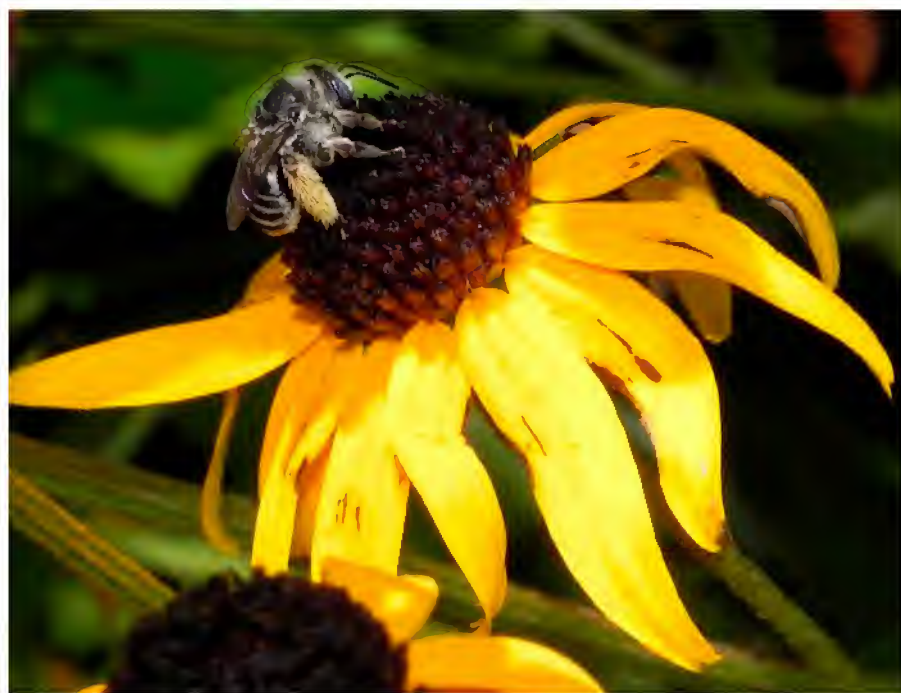
The large size of [bumble bees](#) makes them more effective [pollinators](#) of some crops like [alfalfa](#) which must be weight-activated to expose their sexual structures. They are one of only a few [bee](#) groups capable of [buzz pollination](#) ([sonication](#)), in which a flower's anthers are vibrated at a certain frequency to release pollen. Plants in the [nightshade family](#), such as [tomatoes](#), require [sonication](#) and [bumble bees](#) are essential to fruit and seed set in these crops.



[Bombus impatiens](#) Cresson, 1863 ([common Eastern bumble bee](#)) involucrum. The [involucrum](#) is a thin wax cover created to protect and insulate the nest, Valley Station, KY. Photo by Barry Nichols, 2011, Nikon Coolpix P100.

According to a publication by Lane Greer in 1999, [bumble bees](#) are the only [potato pollinators](#) in the world. Unlike [honey bees](#), [bumble bees](#) are incapable of recruiting their sisters to flowers, and are therefore more faithful to the crops for which they are [managed](#).

ALKALI BEES-- [Nomia melanderi](#) ([Cockerell](#), 1906), the [alkali bee](#), nests in moist [alkaline soils](#), hence its common name. Although they are [solitary](#), their nests may be found in [congregations](#) of thousands where [habitat](#) is suitable. In the 1950s farmers learned that they could attract these valuable [pollinators](#) by creating appropriate nest sites, and [alkali bees](#) remain one of the few [solitary species](#) which have been commercially [managed](#). As reported by [Buchmann](#) and [Nabhan](#) in 1996, [alkali bees](#) were essential to [alfalfa production](#) in the U.S. for several decades. [Alfalfa seed](#)



A female [Melissodes](#) sp. (solitary [bee](#)) feeding on [Rudbeckia hirta](#) L. 1753 ([black-eyed Susan](#)) in Valley Station, KY. Notice the [corbiculum](#), specialized area of the back leg with long hairs designed to hold pollen. Photo by Barry Nichols, 2011, Nikon Coolpix P100. [John S. Ascher](#) ([American Museum of Natural History Bee Database Project](#)) identified the bee.

alone was worth \$115 million in 1990 and the contributions of this crop to the American economy have already been highlighted.

Unfortunately, the importance of [alkali bees](#) to [alfalfa](#) yield was not realized until it was possibly too late to maintain their populations at a sustainable level. In the 1940s demand for [alfalfa seed](#) led farmers to plow more of their land, including alkaline soils where [bees](#) were [nesting](#). In the 1950s and '60s pesticides which are toxic to [alkali bees](#) were used on [alfalfa](#) to control pest insects. [Alkali bees](#) are also vulnerable to heavy summer rains, which coincide with their nesting times, and their numbers suffered as a result of this as well. These combined factors killed many of the wild [alkali bees](#) in [Washington state](#), and led to a loss in [alfalfa](#) revenue of \$275,000 in 1973. [Alkali bees](#) also suffer from competition between [honey bees](#) and [alfalfa leaf-cutting bees](#) (described below), which has contributed to their population declines in recent decades.

ALFALFA LEAF-CUTTING BEES-- The [alfalfa leafcutting bee](#), *Megachile rotundata* (Fabricius, 1793), was unintentionally introduced to the U.S. from Asia in the late 1930s and is now one of our primary [alfalfa pollinators](#). [Alfalfa leafcutting bees](#) have also been found to benefit seed formation in many clover varieties in North America.



A *Peponapis* sp. ([squash bee](#)) in a *Cucurbita pepo* Linnaeus, 1753 ([zucchini](#)) blossom. Photo by R. Berg, 2010, Canon Powershot SD 1100 IS.

Rather than nesting in soil like [alkali bees](#), [leaf-cutting bees](#) [nest](#) in pre-existing holes in wood or stems. Their common name is derived from the habit by female bees of removing circular leaf sections with which to line their [brood cells](#). [Leaf-cutting bees](#) have proven more [manageable](#) as [pollinators](#) than [alkali bees](#) because they tolerate a broader range of habitats and readily accept [artificial nest sites](#).

SQUASH BEES-- [Squash bees](#) in the genera *Peponapis* and *Xenoglossa* feed almost exclusively on [nectar](#) and [pollen](#) from plants in the family *Cucurbitaceae*, namely [squash](#), [gourds](#), [pumpkins](#), and [cucumbers](#). They are [soil-nesters](#) with an annual life cycle similar to other [pollen bees](#). These [bees](#) are extremely effective [pollinators](#) of [cucurbits](#) and have been found to be more beneficial to these crops than [honey bees](#). A study in Mexico found that it would take 3.3 [honey bee](#) visits to facilitate full seed formation in [gourds](#), but only 1.3 visits by a [squash bee](#) female. [Squash bees](#) are often observed resting, sleeping, and mating inside squash blossoms, [pollinating](#) the flowers in the process.

ORCHARD MASON BEES-- Bees in the genus *Osmia* are called "[masons](#)" because they line their [nests](#) with mud or pebbles. [Orchard mason bees](#) are also named because they are excellent [pollinators](#) of [orchard crops](#) such as [apples](#) and [pears](#), and they show great potential as [blueberry pollinators](#). These [bees](#) are [solitary](#) but gregarious, preferring to [nest](#) near conspecifics. Females build [nests](#) in stems or wood, and readily accept [manmade nest sites](#). Research has found that, like [squash bees](#), [orchard mason bees](#) are more effective [pollinators](#) on their choice plants than [honey bees](#). Despite these characteristics, [orchard](#)

[mason bee management](#) is not practiced on a large commercial scale. However, recent studies report that successful management of [blue orchard bees](#) is increasing, making this species one of a few [pollen bees](#) to be commercially maintained.

CHALLENGES AND CONCLUSIONS

The species described above represent only some of [North America's](#) commercially valuable [pollen bees](#). As already discussed, these and other [bees are declining worldwide](#), endangering the stability of [global biodiversity](#) and our [food supply](#). [Bee diversity](#) is very low in agriculturally-intense [European countries](#) and [plant-pollinator communities](#) as a whole are failing in these areas. Research shows that specialist [bees](#), those that only feed on [pollen](#) from a certain group of plants, have lower genetic diversity than generalist [bees](#), putting them and their host plants at greater extinction risk. One possible reason for [global bee decline](#) is a loss of [plant diversity](#) resulting from [habitat](#) destruction and intensive agricultural practices. [Buchmann](#) and Nabhan reported in [The Forgotten Pollinators](#) that 65% of 258 plant species show incomplete fruit set from lack of [pollinator](#) visits. Several authors cite lack of basic [natural history](#) and [taxonomic information](#) as a major obstacle in [conserving global bee fauna](#).



A female [Megachile](#) sp. ([leaf-cutter bee](#)) feeds on [Heliotropium](#) sp. flower, [Skidaway Island](#), Chatham County, Georgia. Note the [scopa](#) on the ventral side of the abdomen. Photo by [Roy Brown Photography](#), 2011, Nikon D300s, Nikon 105mm macro, no flash, aperture priority, matrix metering, hand-held. [John S. Ascher](#) ([American Museum of Natural History Bee Database Project](#)) identified the bee.

We are in the midst of a crisis of alarming scale. In an effort to halt the demise of our most valuable [pollinators](#), researchers are attempting to elucidate ways in which to [bolster bee populations](#). All [bees](#) have three basic requirements: [nest sites](#), [food](#), and [protection](#) from [pesticides](#). These requirements are [species-specific](#), and must be considered when [determining](#) a [conservation plan](#). [Bees](#) such as the [orchard mason](#) will nest in a variety of conditions, whereas others are very particular. All [bees](#) require season-long [food plants](#) as well. Several sources have found that allowing [agricultural](#) field margins to persist and providing fallow fields near crops will benefit [pollen bees](#). Planting wildflower seed mixtures that bloom when target crops are inactive have proven highly beneficial in maintaining many [pollen bee](#) species. Some studies have found that diverse flower mixtures attract the most [bees](#), but that care should be taken to tailor flower mixtures to [bee](#) species of interest, as not all [bees](#) respond similarly to flower diversity and density.

Studies have also found that proximity to [natural areas](#) positively affects [bee diversity](#). [Organic farming](#) practices are also beneficial for [bees](#) and other [pollinators](#). Organic farms near natural habitats maintain the highest [bee diversity](#), and can have enough [native pollinators](#) to provide all necessary [pollination](#). Connectivity of natural habitats can also be important to maintaining [pollinator populations](#), as can increasing diversity of habitats bordering farmlands. Unused land sections, such as power line rights-of-way and highway medians can be extremely valuable for [conserving native pollinators](#).

[Athena Rayne Anderson](#) is a self-described naturalist who is currently working on her Ph.D. in Ecology at the [Odum School Of Ecology](#) at the [University Of Georgia](#). While she has a broad interest in pollinator community ecology and conservation, her current research focuses on several aspects of bumble bee foraging ecology, including seasonal activity and flower density preference. She is keenly interested in bumble bees due to their importance ecologically for the pollination services they provide (in some cases better than any other bee group!). She has created a new blog (<http://www.pollinators.info>) about pollinators, designed to provide pollinator-related information, resources, and community outreach.

THE KENTUCKY DIVISION OF FISH & WILDLIFE RESOURCES INVENTORIES AND MANAGES KENTUCKY'S BARN OWLS (*TYTO ALBA*)

by Kate Heyden

[Tyto alba](#) ([Scopoli, 1769](#)), the [barn owl](#), is a nocturnal [raptor](#) found in open habitats where it preys primarily on rodents and other small [mammals](#). Although the species is one of the most widely distributed birds in the world (found on all continents except for [Antarctica](#)), in Kentucky, records of nesting [barn owls](#) have been quite rare in modern times. The infrequency of [barn owl](#) reports in Kentucky is somewhat surprising because much suitable habitat in the form of pastures, hayfields, croplands, reclaimed surface-mine lands, and restored grasslands is present. In fact, 38% of the state is composed of undeveloped, open land. With such an abundance of suitable habitat, it seems Kentucky should host an abundance of [barn owls](#).

[Barn owls](#) have gained [conservation](#) concern throughout most of [North America](#) in recent years due to noticeable population changes. Severe [declines](#) have been recorded in several Midwestern states. Due to local conservation concern, the [barn owl](#) has been listed as a [Species of Greatest Conservation Need](#) in [Kentucky's State Wildlife Action Plan](#).

[Conservation](#) actions for declining species are usually best implemented when the status of the population is known. In the case of [barn owl](#), so little was known about its status in Kentucky that the [Kentucky Department of Fish & Wildlife Resources](#) (KDFWR) decided to conduct a statewide inventory in 2010. The goal of this effort was to document as many resident [barn owls](#) as possible.

Twenty-six confirmed [barn owl](#) nest locations were documented during the 2010



KDFWR bands rescued or rehabilitated barn owls. Photo by Kate Heyden, 2011.

inventory. Most [nests](#) were found on privately owned land, although three were in [nest boxes](#) on [Wildlife Management Areas \(WMAs\)](#). Nests were found in a variety of structures including [nest boxes](#), silos, grain bins, barns, hollow trees, chimneys, and even shooting houses. [Nests](#) were scattered throughout much of central and western Kentucky, but none were reported in southeastern Kentucky (Figure 1).

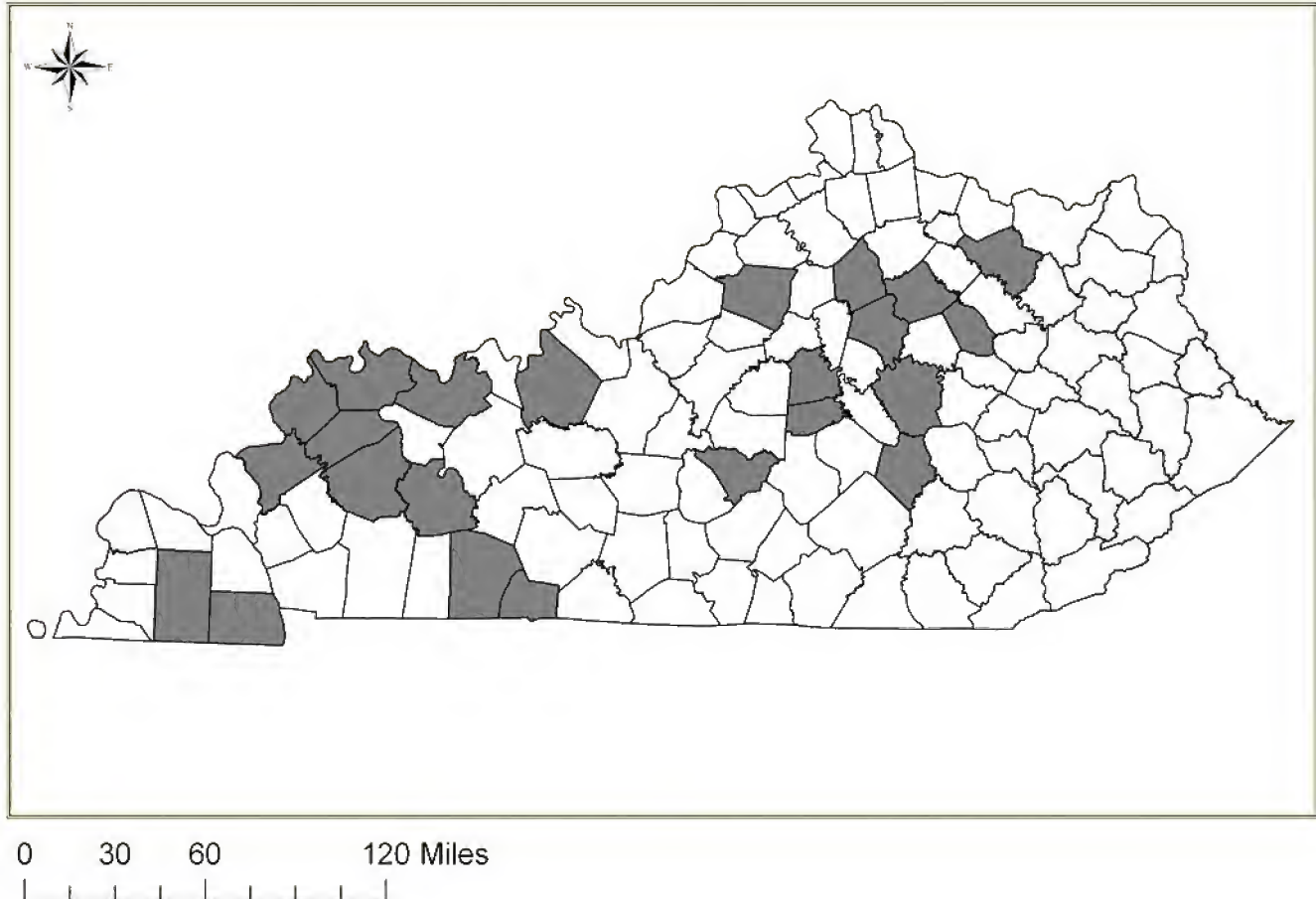


Figure 1. County distribution of known nesting barn owl pairs documented during 2010.

Once located, the productivity of each [nest](#) was monitored where possible. Nests contained 2–8 young. [Nesting](#) was typically initiated during spring (March–April) and most young fledged by the end of July. Unexpectedly, nesting activity continued into late summer and fall/winter with five nests documented with young after September! Surprisingly, “double-brooding” or attempting to raise two nests of [young](#) in one year was documented at two of these late nests which continued into December! This is the first time nesting during fall/winter and double-brooding have been documented in Kentucky.

Suitable nest site availability in the proximity of areas with a large prey base is assumed to be a major limiting factor for [barn owl](#) populations. KDFWR established a program to install [nest boxes](#) in suitable habitat on WMAs and other public lands in 2006. Since 2006, 37 [nest boxes](#) have been installed on public lands. Although several [nest boxes](#) on public lands have already become active, in 2010 our [nest box](#) efforts switched to maximizing the productivity of existing [barn owl](#) nests - whether they are on public or private land. Productivity may be hindered at unreliable nest

sites, perhaps contributing to [barn owl](#) declines. For example, many nests are discovered when hollow trees are cut down, grain bins are drained, or old barns are demolished. In 2010, KDFWR worked to ensure that all known nesting [barn owl](#) pairs had a safe and permanent nest site by installing many [nest boxes](#) on private lands. Overall, since 2006, KDFWR has installed 75 [nest boxes](#) on public and private lands. It is hoped that these efforts will encourage a more stable [barn owl](#) nesting population statewide.

Because most [barn owls](#) are on private land, the extent of KDFWR's knowledge of and ability to help [Kentucky's barn owls](#) depends greatly on the public's cooperation in reporting nests. Please report [barn owl](#) nests by calling 800-858-1549 or e-mailing Kate Heyden at Kathryn.Heyden@ky.gov. Interested landowners that would like to install their own [nest box](#) can find **construction plans** via the internet at: <http://fw.ky.gov/pdf/barnowlboxes2010.pdf>. Private landowners are encouraged to inform KDFWR of any [nest boxes](#) installed and if they become active. More information on Kentucky [barn owls](#) will also soon be available at: <http://fw.ky.gov/navigation.aspx?cid=899&navpath=C753C755>.

Kate Heyden is an avian biologist for the [Kentucky Department of Fish & Wildlife Resources](#). She specializes in raptors and songbirds. She previously worked on [red-cockaded woodpeckers in Louisiana](#) before moving to KY to work with the state a few years ago.

PRESENTING BLARINA
THE TINY TERROR OF THE WOODS
by A. Brooker Klugh



A CHARACTERISTIC POSE: *Blarina* sniffs the air, while his whiskers feel each breath of wind

[BLARINA](#) the Terrible! Who can and does capture and kill nearly twice his weight in [mice](#)! Who travels through the leaves and humus of the [forest](#) floor at the rate of a foot a minute! Who escapes the notice of many who believe they have knowledge of all the little folk of the [woodland](#)!

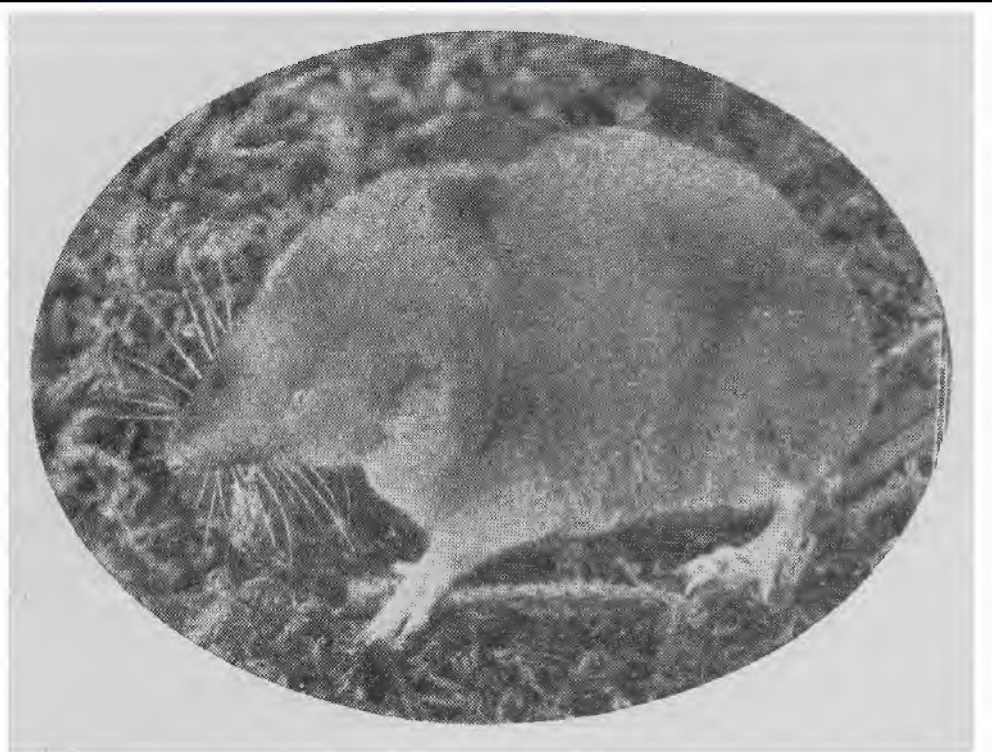
[Blarina](#), whose full name is [Blarina brevicauda Say](#) 1823, is the [Northern short-tailed shrew](#) common to the [eastern North American forests](#). He is more active at night than during the day, and travels about beneath the dead leaf and moss carpet of the woods, rarely exposing himself for more than an instant.

[Blarina](#) is about five inches in length, this little fellow, with a tail only an inch long. Dark brownish-gray above, his fine, glossy coat shades to a paler color on the under surface. Not much in the way of ears has he for they are not visible externally. [Blarina](#)'s eyes are very small, and his snout is long and pointed.

In the case of such an elusive little [mammal](#) as [Blarina](#) it is doubly difficult to determine

how numerous is his kind. I know, however, that there are few pieces of [woodland](#) in which one cannot, by prolonged watching, catch a [glimpse](#) of him. [Seton](#) estimates that in a wood at Cos Cob, Connecticut, there were certainly fifty of these animals to the acre, and [Shull](#), who has made a detailed study of the [species](#), estimates that there are at least four of these animals to the acre throughout the [range of the species](#).

The [Northern short-tailed shrew](#) excavates [burrows](#) which are from an inch to an inch and a quarter in diameter, and which vary in length from five feet to several yards. The [tunnels are usually tortuous](#), with several side-branches which often connect with one another, and some portions of the [tunnel](#) may be as deep as sixteen inches below the surface of the soil. The [tunnels](#) have two or more openings which go down at a steep angle for some six to eight inches. At some point along the tunnel is placed the [nest](#), composed of grass, sedge, or leaves. Here hollow balls from four and a half to six inches in diameter, with walls half an inch to an inch and a quarter in thickness, are hollowed out. As shown by [Shull](#), although the [nest](#) of the [shrew](#) resembles that of the [meadow mouse](#), none of the coarser material of which the nest is composed is shredded by the [shrew](#) as is done by the other [woodland creature](#).



AN ALERT LITTLE BURROWER: *Blarina* travels underground at the rate of a foot in a minute, if conditions are right.

[Blarina](#) burrows by strong outward and backward strokes of its front feet and forces its body through the soil -like a wedge. It has been found that in loose soil a [shrew](#) had no difficulty in burrowing at the rate of a foot in a minute, and I have noticed that when burrowing beneath the mossy carpet in the woods they often progress at a rate of about a yard in fifteen seconds.

Comparatively little is known of the domestic affairs of the [little animal](#). [Merriam](#), [Seton](#), and [Shull](#) all record finding a pair of this species together at various seasons of the year, so that there is a possibility that they mate for life. Two or three litters of from two to six young are produced in a season, and young have been found from late April until late September.

Both summer and winter are busy times for the [shrew](#). In winter it not only burrows about beneath the snow, but makes long journeys over the surface, burrowing down whenever it comes to an elevation which indicates the presence of a log or stump, to [feed](#), as is assumed by [Merriam](#), on hibernating insects and pupae.

The creature's [voice](#) is, like that of all [shrews](#) and hats, high-pitched. Sometimes it utters a [single shrill note](#), hut more usually it emits a [continuous twittering sound](#). A pair which came into my tent night after night at one of my campsites in northern Ontario kept up a continual [twittering](#) as musical as the notes of the [American goldfinch](#).

Blarina is mainly carnivorous and insectivorous, although at times it eats vegetable food, including beechnuts. Its main diet probably consists of large numbers of insects which it takes in the adult, larval and pupal stages. Shull found that an individual of this species required fifteen adult May beetles or June bugs, as they are often called, as a day's rations. An individual which I kept for a time ate three large specimens of Melanoplus bivittatus Say, 1825, the two-striped locust, in five minutes, and this same animal devoured six of these locusts, two crickets, a caterpillar, and forty-five smaller insects, in the course of a day. In capturing the large insects it always seized them by the head, which it crushed eagerly with a loud crunching sound.



ABOUT TO DISAPPEAR: Frightened, Blarina makes for home, displaying the tiny tail for which he is named.

Mice stand as a close second to insects in the diet of the short-tailed shrew, the species most frequently captured being the meadow mouse, an animal nearly twice the size and weight of the shrew. In attacking it exhibits much ferocity, strength and persistence. Morden, who was one of the first to describe the habits of this species, says: "Four large meadow mice were procured and placed in the boiler with the mole-shrew, which as soon as it met a mouse showed fight. The mole-shrew did not seem to see very plainly and started round the boiler at a lively rate, reaching and scenting in all directions. The mice seemed terror-stricken, momentarily rising on their hind legs, looking for a place to escape, squeaking in their efforts to keep out of the way of the mole-shrew, which pursued them constantly. The shrew's method of attack was to seize the mouse in the region of the throat, which it did by turning its head as it sprang at the mouse. The mice would strike at it and usually knock it away with their front feet. The shrew at last attacked one mouse and stayed

with it, and in about ten minutes had it killed and commenced eating the eyes and face."

Merriam found a short-tailed shrew weighing 11.2 grams could tire out and overcome a vigorous deer mouse weighing seventeen grams, the shrew taking half an hour to exhaust the mouse and another half hour to kill it. It does not seem likely that a shrew could catch the mice on open ground, but it undoubtedly captures them in their burrows. The fact that under natural conditions a considerable part of the diet of Blarina consists of these animals is shown by the finding of the bodies of two freshly-killed meadow mice and that of a third partly eaten, as well as several handfuls of

hair in which were mixed tails and legs enough to account for about twenty more, at the nest of a [shrew](#) investigated by [Shull](#).

The items of [food](#) which rank next to insects and mice in [Blarina](#)'s diet are [snails](#) and [earthworms](#), and the relative number of these eaten depends on the locality and the season. [Shull](#) found that in a tract of low land this species fed very largely on [snails](#) in winter, the main species eaten being the white-lipped [land snail](#). The [snails](#) were gathered and hoarded in piles. They were moved to the surface, just outside the burrow, when the temperature fell, and back into the burrow when the temperature rose, thus being kept in the coldest place available, and therefore remaining in an immobile condition. [Shull](#) also found that though empty shells were sometimes brought to the surface, they were not taken down again, and his experiments indicated that the [shrew](#) distinguished between empty and inhabited shells by odor, or possibly by odor combined with weight. That weight alone was not the means of discrimination was shown by the fact that shells filled with soil until they weighed exactly the same as an inhabited shell were not taken into the burrows. Sometimes the shell was broken to get at the [snail](#), but frequently the animal was dragged out without damaging the shell. About one hundred and twenty [snails](#) formed a month's rations.

In places where [earthworms](#) are abundant they undoubtedly constitute an important [item](#) in the menu of [Blarina](#), and [Shull](#) discovered that when these alone were fed to a [shrew](#) it required thirty-five [worms](#), about two inches long when contracted, to serve for a day.

The [voracious fellow](#) also eats other animal food, such as sowbugs, and [Merriam](#) mentions that it hoards and eats [beechnuts](#), while Plummer says that a specimen which he had in captivity ate corn and other grain. [Shull](#) found that it would not touch vegetable material as long as animal food was available, and it is probable that under natural conditions vegetable food is very rarely taken.

Among the enemies of the [short-tailed shrew](#) are [foxes](#); [Neovison vison](#) ([Schreber](#), 1777), [minks](#); [Mustela](#) species, [weasels](#); [hawks](#); [owls](#); and [snakes](#). The three [mammals](#) mentioned sometimes kill [shrews](#), but apparently rarely eat them, probably because of their rank odor, and it seems that they are seized in mistake for a [mouse](#). Four species of [snakes](#) are known to eat [shrews](#), but only to a very limited extent. [Hawks](#) and [owls](#) are their chief enemies. [Shull](#) records that a [shrew](#) which he had in captivity for five weeks became entirely oblivious to sounds, even of considerable intensity, which were often repeated, with the exception of the flutter of the wings of a [Columba livia](#) [Gmelin](#), 1789, or [pigeon](#), which was kept in the same place. This sound always sent it scurrying to its burrow, and though it must have heard it hundreds of times, it produced as great a disturbance of the [shrew](#)'s equanimity at the end of the period as it did at the beginning.

The [shrew](#)'s sense of sight is extremely poor, and serves merely to distinguish light from shadow, as is shown by experiments by [Kennicott](#), [Merriam](#), [Shull](#) and myself. Its senses of smell and hearing, however, are acute, and the former sense would seem to be the main one employed in locating food and the latter in escaping from its enemies. Likewise, it is very sensitive to touch, the "whiskers" especially being important organs. The lightest contact, even with a current of air, is responded to immediately.

When out foraging the [short-tailed shrew](#) runs about with its nose held rather high, investigates every nook and crevice, and smells over any object with which its whiskers come in contact. When out in the daytime it keeps as much as possible in the shade, and the intense light and heat cause it serious discomfort if it is exposed to full sunlight for any length of time.

Such a [ferocious little beast](#) might reasonably be expected to prove entirely untamable, but I found that an individual I possessed for some time, and handled a good deal, became markedly less savage and ready to [bite](#) in twenty-four hours, while Plummer kept one which soon became quite tame, taking food from his hand. It learned to come at call and never failed to respond, except when in its nest, and apparently very sound asleep, in the middle of a hot summer day. When running about the [shrew](#) usually kept close to the wall, or under furniture, but it would come out into the middle

of the room if called. This act of overcoming its natural aversion to open places shows how greatly its mode of behavior had been changed by good treatment.

A curious little fellow-this [shrew](#). It would take years to learn all about him, but even a short study will serve to prove him interesting and unusual-the "terrible tyke" of the [woodland floor](#).

A. Brooker Klugh, M. A., Ph.D., who is now Assistant Professor of Biology, Queen's University, Canada, follows the career of Nature photographer only as an avocation. His main [interest](#) lies in plant [and animal ecology](#), -the effect of physical factors of habitats on the forms of life therein. At present, he is devoting most of his attention to light's effects on living organisms. In his hobby, he has developed many new methods for underwater, insect and flower photography, and is Nature editor of American Photography. He is a frequent contributor to Nature and other magazines. [Ed. Note: [Alfred Brooker Klugh](#) (1882-1932) died in an accident two years after he wrote this article. See [The Canadian Field Naturalist, Volume 46, page 170](#)]

This article was reprinted from:

[Klugh, Alfred Brooker](#). 1930. Presenting *Blarina*: The Tiny Terror of the Woods. Nature Magazine, Washington, DC. April: 241-243. Note: Nature Magazine was published by The American Nature Association. [Ed. Note: Minor modifications made in order to accommodate formatting]

CHAPTER NEWS

Falls of the Ohio Chapter Events (see front cover for regular meeting times and place, field trip times may be found below or are to be determined. Contact Chapter President **Chris Bidwell** at (502) 896-4834 or via email at: mabteacher1@yahoo.com.for more information. You can contact the Photo Contest Coordinator **Susan Wilson** via email at (susanfltrn@yahoo.com).

2011 Dates	Event/Speaker or Leader	Topic / Outing	Photo Contest Topic
September 15	TBD	TBD	Nature Nuts
October 20	Waterfalls - Tom Barnes	TBD	Waterfalls
November 17	The History of Beargrass Creek - Tom Owen	TBD	Urban Mammals
December	Annual Dinner: at the Episcopal Home off Westport Road, Louisville, KY	Presentation TBD later.	The cumulative winners of the Falls of the Ohio Chapter year-long photo contests will be announced.

KENTUCKY NATURALISTS' CALENDAR

(added as space and time allow)

2011:

August 27, 2011: Mammoth Cave celebrates International Bat Night @ the Visitor Center, Mammoth Cave National Park, Mammoth Cave, KY 42259. This year has been designated as International Year of the Bat (IYB), and August 27 was designated as International Bat Night. MCNP is home to 13 species of bats. Bat-related activities will be held across the world to focus attention on bats. Daytime activities (8:00 AM to 4:00 PM-CST) include displays, Junior Ranger activities, and more bat information. There will be a bat evening program at the park amphitheatre at 7:30 p.m. From 8:00 to 9:30 p.m., three monitoring stations will be set up between the back door of the visitor center and the Historic Entrance of Mammoth Cave. For more information on the [International Year of the Bat](#) go to <http://www.yearofthebat.org/about-year-of-the-bat/>. For more information about IYB activities at MCNP call (270)758-2192 or visit their website at <http://www.nps.gov/macapa/parknews/bat-night.htm>.

September 3, 2011: Archaeology Day @ Falls of the Ohio State Park Interpretive Center, 201 W. Riverside Drive, Clarksville, Indiana 47129 (9:30 a.m. - 4:00 p.m.). Sponsored by the Falls of the Ohio Archaeology Society. Enjoy educational displays with hands-on activities for the kids including: atlatl throwing, three sisters bracelets, corn grinding, mock dig, pottery making, using stone tools, and more! Adults - archaeologists are available to date your artifacts and explain how they were used. Contact the park at (812) 280-9970, or via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org>.

September 16-17, 2011: The [Kentucky Association for Environmental Education](http://www.kaee.org)'s 35th Annual Conference @ the Brown Hotel, 335 West Broadway, Louisville, Kentucky 40202. The theme for the 2011 conference is "Environmental Education: Everywhere for Everyone." While environmental education is at home in the forests and fields, it also has a well-established foothold in the cities. Urban gardening, green building design, and cleaner transportation are all considerations in population centers. Wherever people live, there is a need for environmental education. To be successful, we must attract a diverse group of people from different ages, genders, ethnicities, and economic backgrounds. For more information, contact KAEE at PO Box 17494, Louisville, KY 40217-0494 or visit the conference website at <http://kaee.org/conference/>. For information about the Brown Hotel, contact them at by phone at (502) 583-1234 or (888) 888-5252.

September 17-18, 2011: Falls Fossil Festival @ Falls of the Ohio State Park Interpretive Center, 201 W. Riverside Drive, Clarksville, Indiana 47129 (September 17 from 9:00 a.m. to 6:00 p.m. & September 18 from 10:00 a.m. to 5:00 p.m.). Guided fossil bed hikes, children's activities, fossil dig, mineral dig, fascinating guest speakers on geology topics, free brochures from almost every fossil park in North America, teachers can sign up and win a 50, 75 or 100 piece geology collection for their school, guided outer and Indiana shore fossil bed hikes, vendor booths with fossils, minerals, lapidary arts, jewelry, books, food, drinks, and more. Free rock and fossil identification -- bring in your unknowns! Sponsors: Falls of the Ohio Foundation, Kyana Geological Society, Kentucky Paleontological Society, and Indiana Society for Paleontology. Outdoor activities are free with \$2 parking. Regular admission applies for Interpretive Center: \$5 adults, \$2 children. Contact the park at (812) 280-9970, or via email at park@falls-of-the-ohio.org, or visit their website at <http://www.falls-of-the-ohio.org>.

September 17, 2011: Barren River Trashmasters Classic @ the Stonehaven Room at Barren River Lake State Resort Park lodge, 1149 State Park Road; Lucas KY 42156. Join us, the U.S. Army Corps of Engineers, Friends of Barren River and WBKO 13 for the annual lakeshore cleanup. We will spend the morning collecting trash then meet at the beach for lunch and entertainment. Door prizes will be awarded. Contact park naturalist Lisa Deavers at lisa.deavers@ky.gov, call (270) 646-2151, or visit their website at <http://parks.ky.gov/findparks/resortparks/br/>.

September 24, 2011: Barren River's Day Canoe Trip @ the Stonehaven Room at Barren River Lake State Resort Park lodge, 1149 State Park Road; Lucas KY 42156. Join us for day outdoors canoeing! We provide all the equipment, training and a box lunch. Leave No Trace Principles will also be taught along the way! Pre-registration is required. This trip is for ages 16 and above. Limited to 14 paddlers. Registration fees apply. Contact Sheila Jones at sheila.jones@ky.gov, call (270) 646-2151, or visit their website at <http://parks.ky.gov/findparks/resortparks/br/>.

September 30-October 2, 2011: Kentucky Society of Natural History 2011 Fall Meeting @ [Cumberland Falls State Resort Park](http://www.cumberlandfallsresort.com). See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

September 30-October 2, 2011: The Kentucky Ornithological Society's Fall Meeting @ [Pine Mountain State Resort Park](http://www.pine-mountain-state-resort.com), Henderson, KY. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.uky.edu/kos/birding.htm>.

October 21-23, 2011: Fall Color Weekend @ [Pine Mountain Settlement School](http://www.pine-mountain-settlement-school.com), 36 Highway 510, Pine Mountain, KY 40810. Fall Color Weekend at Pine Mountain Settlement School offers activities for people of all ages. Features include hikes, multi-media presentations, and the opportunity to enjoy some of Kentucky's most beautiful natural areas and stunning autumn foliage. Fee based. Contact the Pine Mountain Settlement School at 606-558-3571 or 606-558-3542 for details. You can also visit their website at <http://www.pinemountainsettlementschool.com/>.

October 21, 2011: Barren River Lake's Annual Geocaching @ the Stonehaven Room at Barren River Lake State Resort Park lodge, 1149 State Park Road; Lucas KY 42156. Join us for this fun weekend of "caching" on the park. Special caches will be hidden for you to find that are suitable for all types of "cachers", including poker caches. There will be a chili dinner and a spooky night cache hunt as well.. So set that GPS system to Barren River Lake State Park and join us for this fun family event. Download Geocache registration form (pdf file) at <http://parks.ky.gov/NR/rdonlyres/68129503-B9E4-497A-B6DF-D00EF0F2437F/0/brgeocachingregistrationform.pdf>. Contact park naturalist Lisa Deavers at lisa.deavers@ky.gov, call (270) 646-2151, or visit their website at <http://parks.ky.gov/findparks/resortparks/br/>.

2012:

April 13-15, 2012: Kentucky Society of Natural History 2012 Spring Meeting @ Shepherdsville Area. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

April 27-29, 2012: The Kentucky Ornithological Society's Spring Meeting @ [Kentucky Dam Village State Resort Park](http://www.kentuckydamvillageresort.com), Gilbertsville, KY. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.uky.edu/kos/birding.htm>.

October 12-14 or 19-21, 2012: Kentucky Society of Natural History 2012 Fall Meeting @ [Pine Mountain State Resort Park](http://www.pine-mountain-state-resort.com). See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

2013:

April 26-28, 2012: Kentucky Society of Natural History 2012 Spring Meeting @ Pine Mountain State Park. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

The mission of the **Kentucky Society of Natural History (KSNH)** is to actively promote study and interest in Kentucky's rich natural heritage throughout the Commonwealth. Members are typically interested in a broad spectrum of natural sciences and related fields. Among the more prominent activities of the KSNH, are the annual spring and fall Conferences, selection of a "Naturalist of the Year", nature photography contests, research grants, and a variety of knowledgeable speakers and field trips. We invite anyone who shares our interests to **join us**.

For membership information or to submit dues please contact:

Kentucky Society of Natural History, 10707 Coogle Lane, Fairdale, KY 40118,

or visit our website <<http://www.ksnh.org>> for the membership form. Membership dues are:
Individual \$15, Family \$25, Full Time Student \$7.50, Lifetime: \$300.

The Kentucky Society of Natural History is an official 501(c) (3) tax-exempt nonprofit organization which was formed in 1939, and incorporated in 1943 in Louisville, Kentucky. All contributions to THE KENTUCKY SOCIETY OF NATURAL HISTORY are tax-deductible to the full extent of federal and state income tax laws.

Published quarterly, The [Kentucky Naturalist News](http://www.ksnh.org) is the official newsletter of KSNH. Unsolicited contributions are encouraged. Please send articles to: **Barry Nichols**, KNN Editor, P. O. Box 21182, Louisville, KY 40221. You can also email newsletter submissions by sending them to kyfauna@iglou.com.

Kentucky Naturalist News Deadlines & Schedule:



<u>Issue</u>	<u>Deadline</u>	<u>Tentative Publish Date</u>
Summer Issue	May 1, 2011	June 1, 2011
Fall Issue	August 1, 2011	September 1, 2011
Winter Issue	November 1, 2011	December 1, 2011
Spring Issue	February 1, 2012	March 1, 2012

For submissions, plan on 0.5-inch margins, 10 pt Arial or Calibri font, and about 2 photos per page. Please leave the photo images in full-size and do not optimize them. Please cite references. To assist, you may use: <http://www.lib.ncsu.edu/lobo2/citationbuilder/citationbuilder.php>.



Kentucky Society of Natural History
3701 Fenholt Road,
Louisville, Kentucky 40218

Formed 1939,



Incorporated 1943

Kentucky Naturalist News

Official Newsletter of the Kentucky Society of Natural History

Volume 69, Number 3, Fall 2011



Website: <http://www.ksnh.org>

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Treasurer: Pat Meyer (treasurer@ksnh.org)

Editor: Barry Nichols (kyfauna@iglou.com)

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Naturalist of the Year: Wally Roberts/Joe Settles

Photography: Susan Wilson (susanfltrn@yahoo.com)

Publicity:

Youth Activities:

Board Members at Large

Berl Meyer (geology@ksnh.org)

Affiliated Chapters

Arches of the Cumberland Chapter (Slade) meets informally, call President Dell Sasser for details, 606-666-7521 x73559, or (606) 233-8938, or via email (dell.sasser@kctcs.edu)

Falls of the Ohio Chapter (Louisville), 9109 Hawthorne Pointe Drive, Louisville, KY 40272, **meets every 3rd Thursday** of each month except Jan, Jul, Aug, & Dec at 7:00 PM at the **Louisville Nature Center**, 3745 Illinois Ave, Louisville, 40213. Call President Chris Bidwell at (502) 458-1328, or via email (mach5049@gmail.com).

Wilderness Trail Chapter (Pineville) meets the first Thursday of each month, March through December, at 7:00 p.m., generally at Pine Mountain State Resort Park in the Ray Harm Room, 1050 State Park Road Pineville, KY 40977-0610 (800-325-1712). Call President Tom Toole at (606) 248-3078, or via email (tom.tdtoole@gmail.com).



A *Urocyon cinereoargenteus* (Schreber, 1775) (gray fox) makes a secretive living in urban Kentucky. The gray fox is one of only two canine species in the world known to climb trees. Photo by Barry Nichols, 2011, Nikon Coolpix P100.

EDITOR'S NOTES

All good things must come to an end. Five years ago I took on the newsletter on a one-year trial basis. After that year I renewed the next two years the same way. Then I agreed to the full two-year tilt during the last election. I can't believe it has been five years! However, I do believe

fresh eyes are always needed to keep an organization vigorous and moving forward. To that end, I notified the board several months ago that I would not be running for re-election as editor for the upcoming term. It has been a genuine pleasure to serve KSNH and I value the time spent doing just that. To each of you with which I had dealings, I thank you for all the learning opportunities, helping me grow, and your time. To those I have yet to meet and work beside, I hope those opportunities arise in the near future. The desire among you to see KSNH flourish was heartfelt and your willingness to step into society responsibilities is testament to your conviction. I hope to be able to continue aiding KSNH efforts in whatever way possible and hope that all of you reading this will also continue to support KSNH with your efforts, time, and money. Like most non-profits, the KSNH has also experienced a decline in revenue and we hope that you'll continue to consider the society worth supporting through your memberships, gift memberships, and donations. We are only as strong as our members will us to be. Again, I extend my gratitude to all of you. I hope this finds you well.

Treasurer Pat Meyer notes the registration form for the 2012 Spring Conference in Shepherdsville (April 20-22) will be on the website at the first of the year. We will be holding our meetings at the Paroquet Springs Conference Center in Shepherdsville.

Some may remember the article entitled, "[Finding Tiny Friends With The Lost Ladybug Project](#)" by Rebecca Smyth and Leslie Allee which introduced the [Lost Ladybug Project](#) in Kentucky Naturalist News 2009 Spring Edition (page 23). It is a citizen science project. Participants can participate as little, or as much as they wish. Recently they made national news when a participant found [Coccinella novemnotata](#) Herbst, 1793, the [nine-spotted ladybug](#). This species is the [NY state insect](#) and the population had [declined](#) so much, it was thought to have been extirpated from NY. In fact, the [population of this once-common species](#) had plummeted in the eastern United States. The first nine-spotted ladybug recorded in 14 years was [found](#) by two children (10 & 11 years old) in Virginia in October 2006. A [Lost Ladybug Project](#) volunteer [found a nine-spotted ladybug](#) on July 30, 2011 in New York! Several volunteers and project staff have since recorded 20 more in NY. So, take a second and take some ladybug pictures when you see them. Try to note what they were found on, location, date, if you can get coordinates...always great! Anyway, log on to their website linked above and participate.

As heralded in the [Kentucky Naturalist News Fall 2010](#), KSNH long-time member Dan Dourson, also 2008 Naturalist of the Year, has written and published a new book, "**Kentucky's Land Snails And Their Ecological Communities**," which is fresh off the press and now available. Because KSNH helped sponsor the book, Dan is offering it to KSNH members for a 12.5% discount. The list price is \$45.00, but the KSNH member price is \$40.00 plus shipping & handling and sales tax. This makes the total for KSNH members \$50.00 shipped to your door. To order a copy, simply email the author at jdourson@earthlink.net. He will send an invoice back via email. You will need to indicate in the email that you are a KSNH member.

For those of you who might be in Louisville from Monday, January 9 through Sunday, January 15, the [Louisville Nature Center](#) (3745 Illinois Avenue, Louisville, KY 40213, Phone: (502) 458-1328, Fax: (502) 458-0232, email: LNC@bellsouth.net.) will conduct an Electronics Drop Off so that you may recycle your old electronics. These items will be recycled by [Commonwealth Computer Recycling \(CCR\)](#). Just place your items in the collection bins in front of the Louisville Nature Center. CCR will take the following items: Computers (both desktop and laptop); CRT & LCD computer monitors; all computer peripherals (including mice, speakers, & keyboards); batteries from UPS units; laptop batteries; rechargeable batteries; alkaline batteries; lead batteries; printers; copiers; scanners; fax machines; medical equipment; fluorescent lamps, ballasts, & bulbs; banking equipment; POS Equipment; game systems; other handheld consumer electronics; televisions; and cell phones.

The Kentucky Society of Natural History welcomes our new members for 2012:

Rebecca Abell
Gretchen Fitzgerald & Jamie Tooill

Hannah Helm
Maude McCarthy

Ron & Meg Riesterberg
David Wellman

Treasurer Pat Meyer reminds us that it's the time of year to renew your membership. It's very easy to do. You can use the information in the text bar on the back page of each newsletter or via paypal through the KSNH website. There is no added fee for using the paypal method of payment.

Please note: The deadline for submissions for the next issue has passed. However, due to the tardiness of the Fall 2011 issue, I will already be working on the Winter 2011 by the time you read this. **Thus, if you wish to make the Winter 2011 issue, please send me your articles as soon as you can in order for me to squeeze you in.** I hope to work quickly so it will be first submissions in, first out. If there are more submissions than we can fit in the next issue, I'll forward them to the new editor (to be announced next issue). A backlog of articles is a rarity for an editor and it would be a nice gift to our incoming editor. **Also please remember that the deadline for the Spring 2012 issue is February 1, 2012. –barry**

NOTES FROM THE NATURE NUT:

SPECIAL MOMENTS IN TIME: REMEMBERING ALLEN LEONARD LAKE (1924-2011)

by W. H. (Wally) Roberts



By now, most KSNH members are aware of the passing of our friend, educator, colleague, and long-time active member of KSNH, [Allen Leonard Lake](#). We all may have known Allen in various capacities, but surely agree that we have lost an incredible mind. What we may all remember most vividly about Allen was his extremely detailed descriptions of the natural world. Perhaps Allen and Betty's daughter said it best at the funeral service by stating, "If you asked Allen the time of day, he would first have to tell you how to build the clock". Although this quote may not be exact, it is definitely a description that could come only from someone who knew him very well.

Over the years, Allen served KSNH in various roles from field trip leader, to astronomy coordinator, to ornithology coordinator, to Vice-President, to President. Although often accused of procrastination, no one can doubt his dedication to nature and The Kentucky Society of Natural History.

Allen, an only child, was born in Jamestown, New York. He often talked about his early childhood in Jamestown. One of his favorite stories was about the memorial parades that he had an opportunity to participate in as a youngster. He proudly spoke of being fortunate enough to march in parades with veterans of the Civil War, Spanish/American War, and World War I.

When World War II began, Allen joined the United States Army Air Corps and served for three years, with two years overseas where he received Medals of Accommodation including the European African Middle Eastern Campaign Medal, three Bronze Stars, and Battle Stars for the Rhineland, Ardennes, and Central Europe.

After returning from the Army, Allen started college and began dating Betty Phillips. Allen and Betty attended Edinboro State Teachers College in Edinboro, Pennsylvania, where Allen received a B.S. Degree in Biology. He then moved to the University of Buffalo to get his M.S. in Biology, and advanced work at Argonne National Laboratory at Stony Brook, part of State University of New York.

Allen loved the sciences. His enthusiasm for learning spread to his students year after year. He taught at Lee's College in Jackson, for seven years, at Morehead State University for thirty years, and at Edinboro State University for two years. Allen taught that every living creature is special and has a purpose in God's grand design.

I first met Allen and Betty in the mid-sixties when I was a biology student at Morehead State University. We had an outstanding Biology Department at MSU, and they helped prepare me for my life's work as a biologist and naturalist. I can still picture Professor Lake making a point in his class by jumping from the floor to the top of a table. This same enthusiasm was expressed on another occasion when he happened to acquire a horse which had been fatally injured when hit by a car on U.S. 60. Allen had me and several other students use everything from scalpels to chainsaws to dissect and study the horse. After studying the horse, Allen had us clean the skeleton, and wire it back together. This same skeleton is still being used today by Morehead biology students.

I forged special relationships with many of my biology professors and remained close friends over the years. Allen was the last survivor of my professors and my friendship with Allen was always special. He taught me Biological Etymology, Medical Etymology, Biological Illustration, and Comparative Anatomy. Perhaps, he best taught me the true value of education and the joys to be found in the natural world.

I spoke with Allen for the last time a couple of weeks before his death. He was a patient at Jewish Hospital in Louisville and assured me he would be leaving the next day to return to Morehead for rehab and to be close to Betty. Allen took a turn for the worse and never left Jewish Hospital.

Many of you may have visited with Allen in April when he drove to Carter Caves on the Saturday of our KSNH Conference. Allen and I talked in the lobby, and I thought at that time that he looked frail. I broke off our conversation when I started to become emotional while thinking about our past history. My last memory of Allen is of my wife, Karen, walking him to his vehicle while I sobbed on the front porch of our room. I felt that we would most likely not be with each other again.

Jeff Foster approached me with the proposal to initiate the KSNH Allen Lake Memorial Grant. We both felt it would be an appropriate tribute for a gentleman who gave so much to educating others of the natural history of Kentucky.

Several members have already contributed to this special fund. We ask that you, too, consider remembering our good friend with a special donation. Donation checks should be made to KSNH Grants and designated in honor of Allen Lake. KSNH is a fully non-profit 501-C3 corporation and all donations to the scholarship/grant funds are fully tax deductible under law.

Our thoughts and prayers are with Allen's wife, Betty, and their family.

*Wally Roberts was [Kentucky Naturalist of the Year](#) 2002. He is a long-time biology instructor, interpretive naturalist, and nature photographer. He graduated with a BS in Biology from [Morehead State University](#), and M.Ed. in Biological Education from the [University of Louisville](#). He's been President of KSNH (three times), former President of the Falls of the Ohio Chapter, and past President of the Board of the [Louisville Nature Center](#). He's currently the **Grant Coordinator** for KSNH.*

2011 NATURAL HISTORY/BIODIVERSITY GRANT RECIPIENTS

by W. H. (Wally) Roberts

The [KSNH Grant](#) Committee is proud to announce the following grant recipients for 2011:

Woody Boebinger Memorial Scholarship

Carl S. Cloyed, Doctorial Candidate, University of Louisville

"Individual Diet Variation in Frogs and Toads of Central Kentucky"

Bernadine Meyer Memorial Scholarship

Sabrina L. McOwen, Masters Degree Candidate, Eastern Kentucky University

“Use of Auditory Stimuli by Carolina Chickadees to Recognize and Inform Conspecifics about Predators”

KSNH Research Grant

Susan K. King, Masters Degree Candidate, Eastern Kentucky University

“Differential Fitness And Nest Site Characteristics Of Four-toed Salamanders in Natural and Constructed Wetlands”

Special Request from Wally Roberts, KSNH Grant Committee Coordinator:

We were pleased again to be able to give the previously mentioned grants for 2011. Funding often prevents us from fully granting requested research amounts. We thank you for your previous generosity and ask you to consider remembering KSNH in the future. KSNH is a fully non-profit 501-C3 corporation and all donations to the scholarship/grant fund are fully tax deductible under law. Please consider KSNH when planning your memorial and gift giving strategies in the future.

***RANA BLAIRI* NEW FROM KENTUCKY!**

by John MacGregor

Hey, guess what? I managed to find a new frog from Kentucky – [*Rana \(Lithobates\) blairi*](#) (Mecham, Littlejohn, Oldham, Brown & Brown, 1973) ([plains leopard frog](#)) – in far western Fulton County. I am attaching photos. Notice the snout spot in front of the eyes, the gaps and offsets in the dorsolateral folds just in front of the hind limbs, and the white dot in the tympanum.



Rana blairi (Mecham, Littlejohn, Oldham, Brown & Brown, 1973) (plains leopard frog) – in far western Fulton County. Photos by John Macgregor, Nikon D300.

The [plains leopard frog](#) was sitting on the side of Elbow Creek Road (just north of Lake No 9 and a mile or so northwest of Reelfoot Lake) at about 4:30 pm on a Thursday afternoon (9/15/2011) with the sun beating down – 88 degrees F and very windy. From a distance I thought it was just a [southern leopard frog](#) (which also has a white dot in the eardrum) but when I pulled up for a closer look and saw the broken and offset dorsolateral folds I realized immediately that I was looking at something I had previously seen only in [Missouri](#). I scrambled out of the vehicle and chased it back and forth across the road and out through the weeds for several minutes and was somehow able to catch it. I may be old and fat, but I can still catch a frog now and then.

The habitat photo was taken from the top of the Mississippi River levee (Sutton Road) beside the Elbow Slough pumping station. The [frog](#) was about 150 m inside the levee, just past the low spot in the road (just beyond where the dark pavement ends).



I plan to submit the record to Herp Review. Since Kentucky does not have a state natural history museum, the [frog](#) has been preserved and deposited in the collection at the Cincinnati Museum of Natural History. Now I really wonder how many of these I have bypassed on rainy nights while searching in that area for mud snakes, cottonmouths, broad-banded water snakes, etc. Rarely, if ever, have I taken time to look hard at a [leopard frog](#) on a wet roadway in the Jackson Purchase Region of Kentucky. All of that has now changed. I will be looking carefully at every [leopard frog](#) out there from now on.

Woo-hoo!

John MacGregor is the Kentucky State Herpetologist in the Nongame Program at the [Kentucky Department of Fish & Wildlife Resources](#). You can reach him at #1 Sportsman's Lane, Frankfort KY 40601, john.macgregor@ky.gov, or call him at (800) 858-1549.

MATCHING: TREES

by Chris Bidwell

Possible Answers: cottonwood, osage orange, catalpa, aspen, alder, chestnut, ginkgo, beech, coffee, apricot, ash, holly

- 1) Much of Venice has these trees to thank for supporting most of their buildings' pilings. _____
- 2) Some biblical scholars believe this tree would be more likely to be found in the Garden of Eden than the apple tree, which tempted Adam. _____
- 3) This tree is also known as the widow maker from the way the tree can suddenly shatter unexpectedly when being cut by a woodcutter and crashing down on them. _____
- 4) Legend has it that this tree grew on the road to Calvary and when the Crucifixion Procession passed by, it refused to bow and thus was punished thereafter by having to "tremble" in shame. _____
- 5) Audubon described the passenger pigeons as "stopping by the thousands" to eat the fruit of this tree. Hunters would wait along with hundreds of hogs to kill and eat these now extinct birds that came to eat this tree's fruit. _____

- 6) Sometimes called the “fish bait tree” for the 3-inch caterpillars that eats its leaves and is a preferred food for a certain sphinx moth. _____
- 7) In Spain dancers twirled to the rhythm of castanets (castanetas) made from 2 dried seed pods from these trees. _____
- 8) These trees probably originated in Ethiopia. Mocha, a Yemen seaport, was once a chief trading port for this tree’s fruit. _____
- 9) Often some of a region’s biggest trees and with their horizontal branches, these trees were once called “gallows trees” as they were used to hang criminals. _____
- 10) These trees have been known to survive an atomic blast--one being about a kilometer from the epicenter at Hiroshima. A new temple was erected around this tree and the words “No More Hiroshima” were carved into it. _____
- 11) The toyon tree of California has bright red berries used for Christmas decorating. Though not in this tree’s family (Aquifolaceae), it might have been the origin of a popular California city’s name famous for movie productions which was founded in 1887 by Horace Wilcox, a prohibitionist who envisioned this city as a community based on sober, religious practices. _____
- 12) An old farmer’s rule for a good fence was that it should be “horse high”, “bull strong”, and “pig tight”. This native western US tree, which was first sent to President Jefferson by Lewis and Clark in 1804, meets requirements for good fencing. These trees which are very thick and thorny, grow rapidly, and are much easier to plant than to construct stone walls, plant hedges, or use wood palings. They make excellent farm hedgerow fences. _____

References

[Laura Martin](#). 1992. The Folklore of Trees and Shrubs. Globe Pequot Press, Guilford, CT. 221 pp.

[Diana Wells](#). 2010. [Lives of the Trees: An Uncommon History](#). Algonquin Books, NY, NY. 369 pp.

Chris Bidwell is an amateur naturalist and the current President of the Falls of the Ohio Chapter of KSNH. He thanks Mary Alice Bidwell for her keen typing skills.

Answers: 1-alder, 2-apricot, 3-ash, 4-aspen, 5-beech, 6-cottonwood, 7-chestnut, 8-coffee, 9-catalpa, 10-ginkgo, 11-holly, 12-osage orange.

FATEFUL FORTUNES OF THE MUD WASPS & MUD DAUBERS:

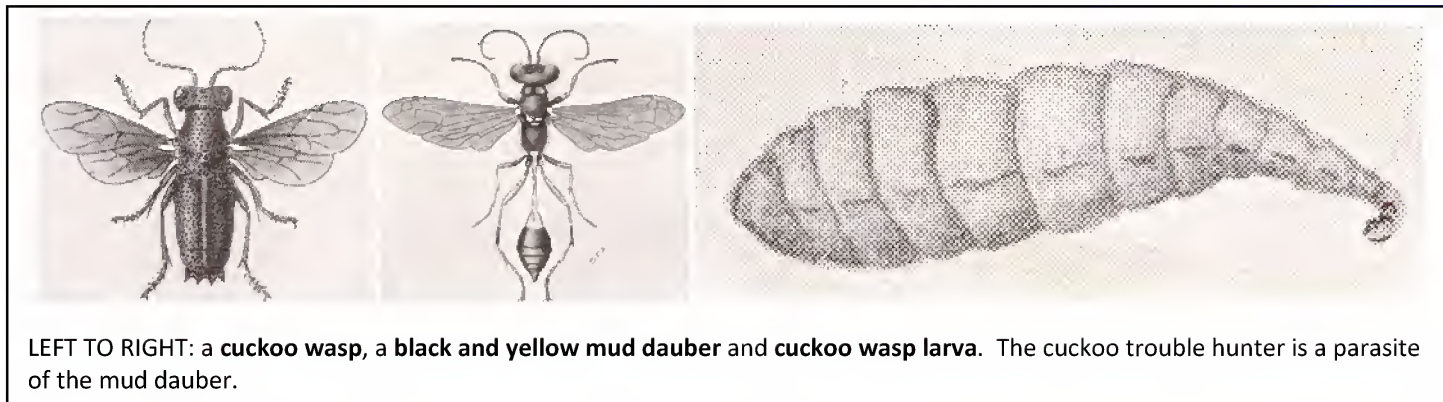
FRIENDS AND FOES MAKE LIFE COMPLICATED

by Samuel Francis (S.F.) Aaron, Illustrated by the author

The student [naturalist](#) must relish the demand made upon him for painstaking research and out of his insistent love of discovery he readily appreciates and learns to anticipate not alone those fewer influences that combine in "the gladness of [nature](#)"; but principally those [tragedies](#) that crowd the annals of the Old Mother [Nature] whom we have too long been taught to regard as the expression of bountiful gentleness and peaceful care.

[Parasitism](#), in its varied forms, exhibits the common blood thirst by which a vast majority of creatures thrive. A persistent examination of the remarkably complicated [life histories](#) of the [mason wasps](#), or [mud daubers](#), and the means adopted by their numerous enemies, unfolds an intriguing series of events in the perpetuation of species.

Heretofore it seems to have been conceded that the sting-protected [Hymenoptera](#) could have no serious enemies. It is well known that the exclusively [parasitic groups](#) circumvent each other. That the [wasps](#) and [bees](#) experience the misfortune of thefts and usurpations has been merely hinted at, however, and, with the exception of the [honey bee](#), very little detailed knowledge has been presented.



The life histories of the [mud daubers](#), when unhindered, have been set forth by [entomologists](#) of both continents. [Fabre's famous observations](#) are most thorough in [describing the habits](#) of the Old World forms, while the [Peckhams](#) in Wisconsin, treating our own two species, have far exceeded the French sage with regard to scientific precision and thoroughness. The first species is [Chalybion californicum](#) (de Saussure, 1867), the [blue mud wasp](#). [Ed. Note: This species is referred to as [blue mason wasp](#), [Pelopeus caeruleus](#) in the original article where it discusses being named "after [Pelops](#), a savage criminal of mythology."] Then there is the longer-waisted, brown, yellow-marked species, [Sceliphron caementarium](#) (Drury, 1773) or [black and yellow mud dauber](#). [Ed. Note: This specific epithet in the original article was "caementarius"]. The generic epithet "[Sceliphron](#)" means a leg of wisdom and refers to the creature's skill, though it really works with its jaws. These two species differ so little in their habits as to make the biography of one precisely fit the other. The [blue mud wasp](#) seems to be most common in certain locations in the West; the [black and yellow mud dauber](#) is often observed in the eastern sections. [Ed. Note: it is now known that both species are fairly common over the entirety of the continental United States and southeastern Canada].

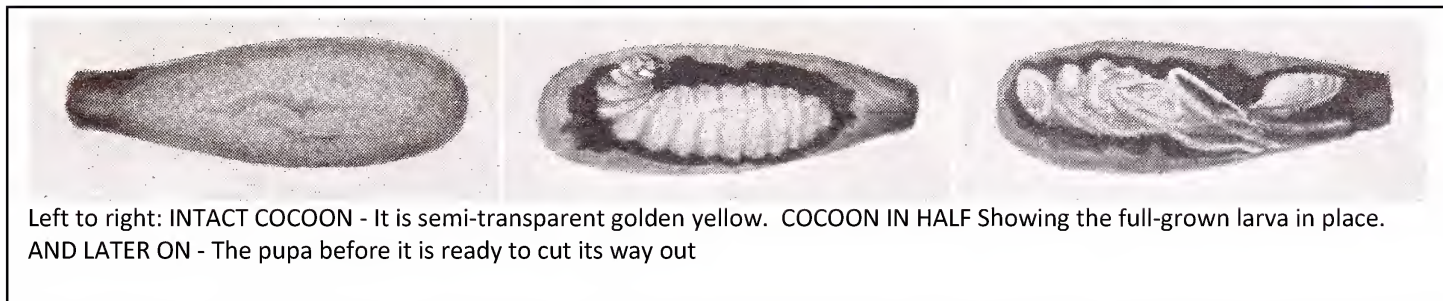
An examination of several [mud nests](#) at any time of year and a little close observation of the wasps at work during the summer months will permit anyone to trace the life histories of these builders. After the females have mated and have selected a situation for the [nests](#) suitably protected from rains, as on the under sides of roofs of accessible buildings, beneath wide rock crevices, or in the mouths of caverns and the insides of hollow trees, active work commences immediately. Damp earth is gathered and within a few hours the first cell is constructed. The outer layer is generally not more than a sixteenth of an inch thick and laid on in rib-like form, often being left to retain that



appearance, or to be further plastered with irregular [bits of mud](#).

[Spider-hunting](#) follows. There is generally a plentiful supply of possible victims near at hand and these may be of all kinds of the busy little eight-legged, many-eyed web makers and others of their class. Probably the [orb weavers](#), [crab spiders](#), and [jumping spiders](#) are preferred because they are most easily captured.

The tremendous energy, swiftness and fearlessness of these workers in clay, and the weapons with which they are endowed, make them well-nigh invincible when [hunting for their prey](#). As the [Peckhams](#) express it: "Her powerful sting fits her to cope with anything she may meet, but as the size of the cell must be considered and the victim must be carried home on the wing she is on the lookout for something not too large. Here, then, she ceases to be an automaton and to some extent makes use of her wits." Thus the mud cells she builds may receive two or three larger [spiders](#) crammed in with force, or over two score smaller specimens packed to the very brim before the entrance is sealed.



Something over a dozen is about the average number, each [spider](#) being the size of or a little smaller than the thorax of the wasp.

The single egg, each clay cell being the chamber of but one offspring, is deposited within this storehouse of plenty and the entrance is closed. The development of the offspring through its three subsequent stages takes place quite beyond the ken or the further care of the mother who is solicitous only in the preparation for these events.

It cannot be fairly determined how many [mud nests](#) and cells one wasp will build, but from the appearance of the nests-for there is often an individual difference -and the location, the number may exceed a dozen. There are from two to three broods from late spring to early fall.

A nest selected at random, one of many sealed up and to all appearances normal, will be found to contain when broken open some cells filled with small [spiders](#) most of which are dead, others twitching when touched, the latter the result of a not too fatal sting. When dumped out of the cells these living victims often assume attitudes of apparent protest, most natural because of the manner of their taking off. It is really a pathetic sight, but, to be sure, these creatures inflict the same kind of slow poison upon helpless victims.

Any number of cells thus examined --provided they have not been interfered with by enemies of the wasps --tells much the same story. The only differences depend upon the individual dispositions of the workers and huntresses, some being careless or prudent, indifferent or persevering, calm or nervous, lazy or industrious. For the most part the observer may give them the closest scrutiny without their showing anything but fear, even pulling down the nests before their very eyes without the little builders resenting it. But in two instances I have had the brown species fly close to my face as though to give me a stab with her poison, forcing retreat.

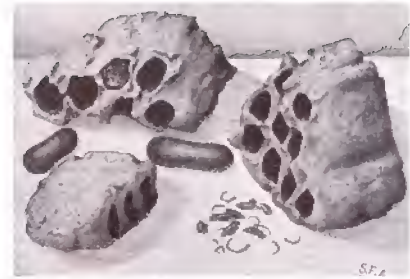
Now and then a cell will be found full of [spiders](#) all dead and drying up, but intact with no egg present. The entrance is sealed. It is a sheer case of forgetfulness and I have found several cells with the egg in place and unsealed. Perhaps something had happened to the little workers to prevent the completion of their tasks.

The varying dispositions of [mud daubers](#) are proved also by their manner of butchery. As the [Peckhams](#) have shown, with abundant further evidence, there is no reason for admitting the correctness of [Fabre's](#) theory that the sting is given merely to paralyze the victims in order to keep them fresh and softly edible for the larvae. A large majority of the [spiders](#) caught are killed at once; all of them will be found dead in some freshly-stored cells, half or more in others and in only a few are the greater number still alive. Observing the wasp capture her [spiders](#) shows for the most part that the stinging is done hurriedly and carelessly and upon any part of the victim's body, but some wasps place the sting with evident care and nearly always beneath the [cephalothorax](#), or at the base of the abdomen.

[Fabre](#), the [Peckhams](#) and others have experimented with the effect of wasp stings on [spiders](#) and certain true insects in order to show the paralyzing or deadly effect. With [beetles](#), [grasshoppers](#) and [caterpillars](#) there is decided value in this, but as for [spiders](#) these investigators have overlooked a salient fact-the extreme and comparative lack of vitality. The mere stabbing of the needle-like posterior organ of defense and offense is sufficient to kill either outright or in a short time, without the poison. This may be proved by the insertion of the tip of a needle into almost any part of a [spider's body](#). Out of sixteen [spiders](#) of various species stabbed quite gently with a slender insect pin fourteen died quickly, or within a few hours and two only partly recovered. The venom, while it does contribute to the fatal effect, is evidently of little use to the [spider](#) hunters.

That the world is not covered with [mud dauber](#) clay nests and the [spiders](#) rendered extinct is due to that balance in Nature common with all species. With regard to these busy little workers in clay it is a matter hardly touched on, much less told in full. The creatures that interfere are two-fold: those that hinder and those that aid in an indirect manner the life-long proceedings of the [mud daubers](#).

In a clay mass containing seven cells, five of them formed vertically on a wall with the scaled ends upright and two horizontally attached to the underside, three were found to contain the undisturbed larva of the [mud dauber](#) each in its parchment-like, yellow cocoon with the inexplicable thick, black, attenuated end. In another cell there were eleven [spiders](#) partly eaten and the half-grown larva of the wasp lifeless, the microscope disclosing a minute mold or [fungus](#), stalked and knob-like in character and variegated in color. To the scientist these vegetable growths attacking many kinds of insects and their allies are known as [Empusa](#) and [Sporotrichum](#), forming a distinct group. The breeze-driven spores enter and lodge in the [spiders](#), or are carried in with them and quickly spread, destroying also the rightful occupant.



BLUE MUD WASP'S NEST - Showing the cocoon of the *Blue mud wasp* parasite.



NEST OF THE BLUE MUD WASP - Showing cocoons of the parasitic *Blue mud wasp* and within is that of the burglar bee.



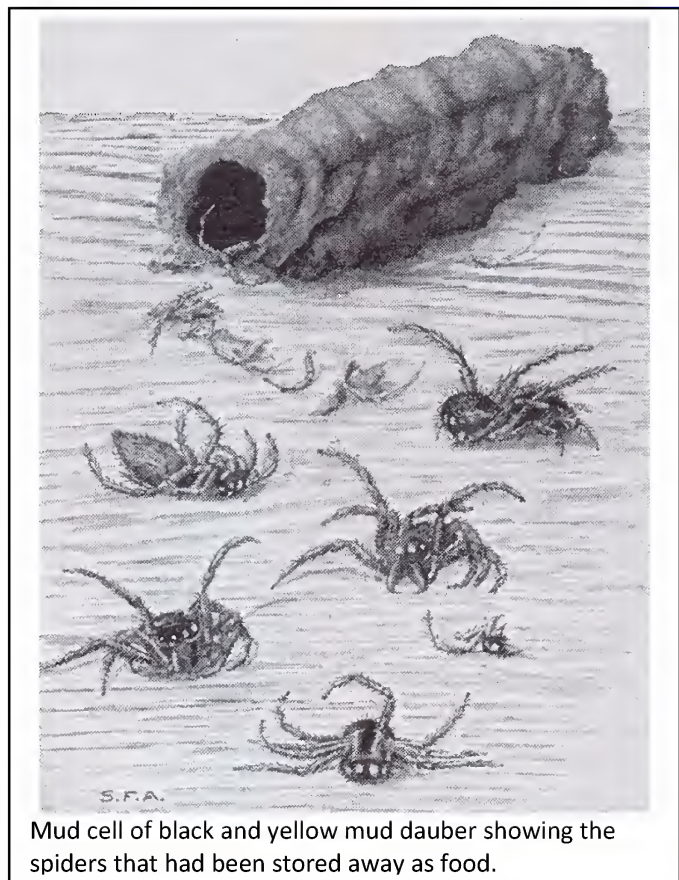
THREE CYCLES OF PARASITISM - *Tachina* larva feeding on the bee larva that has cut into the black and yellow mud dauber's nest to destroy the interloping blue mud wasp.

In another cell there was no sign of the larva other than the thick, black end of the cocoon, showing that the insect had reached its growth and was ready to pass into the pupal stage. There was a mass of fine dust also, this condition being easily explained by the presence of two fat and well-contented, brown, hirsute, active larvae of that familiar and most unwelcome pest, *Anthrenus scrophulariae* (Linnaeus, 1758), the [common carpet beetle](#) or [buffalo beetle](#). Entering the cell when the wasp was absent the mother [beetle](#) deposited but two eggs on the collection of [spiders](#) and after the cell was sealed these hatched. Besides dining sumptuously upon the [stored spiders](#) the [beetle larvae](#) soon settled the fate of the slow-growing, lethargic wasp maggot. Another one of these cells in the center of the mass was thus infested with but one [buffalo beetle](#) larva and the store of [spiders](#) only partly eaten; the [wasp larva](#) was still alive, though doomed had we not interrupted the course of events.

But a more genuine case of [parasitism](#) will be disclosed. From one broken cell a small horde of fly maggots, the larvae of a *Tachina* (meaning swift of wing) was jostled out with parts of the [spiders](#) eaten by them and a portion of the wasp larva also. The author of this mischief had also entered the unguarded cell and deposited a dozen or more eggs, as she would have upon any live [caterpillar](#) or other immature insect happened upon.

There is very often a mystery to confront us in these clay cells. Full-grown larvae of the [mud daubers](#) are found quite dead without any apparent reason for this condition and the microscope fails to disclose any evidence whatever, though very probably an exceedingly minute [fungus](#), or some bacterial infection, is responsible.

During the late summer it is not unusual to note, flying about and frequently on or near groups of [mud dauber nests](#), a resplendent insect all of golden-green with iridescent reflections, a creature not more than one-fourth of an inch in length, but of such a brilliant hue as to attract immediate attention. This is a [cuckoo wasp](#), *Chrysis nitidula* Fabricius, 1775. It is one of a group of many species and genera all of which are probably parasitic. They are little things, swift of wing, easily avoiding the occasional dashes of the [mud dauber](#) and quickly returning to wait until the builder has departed for more [spiders](#). Then they slip into partly stored cells and are almost immediately out again and away.



Mud cell of black and yellow mud dauber showing the spiders that had been stored away as food.

Further examination of many cells bears out this more indirect observation. From an exceedingly small percentage recorded, the cells of the [mud dauber](#) under cover gave forth adult wasps of the species cited. One was discovered in the larval state.

Other surprises confront the investigator of mud wasp nests. In a nest of five cells of the black-and-yellow mud dauber, one was filled with undamaged [spiders](#) and a mysteriously dead *Chrysis* larva; two contained normal pupae of the builder, and two others yielded cocoons of very different character. These were hard, rigid, evenly cylindrical or slightly constricted in the middle with spherical ends and dark brown in color. From these in due time emerged wasps about the size of the [mud dauber](#), but less slender and with much less restricted and elongated abdominal petioles, almost uniformly shining black, close inspection showing the tarsi of the hind legs to be entirely white.

It is not difficult to recognize this species, like the [cuckoo wasp](#) boldly frequenting the region of [mud dauber](#) nests in late summer, passing in and out of the cells when the builder

is absent, often chased away when the [mud dauber](#) returns, and always showing little fear. This interloper is the [blue mud wasp](#) which also stores its nest with [spiders](#) and [leaf bugs](#), though making no burrows of their own in any case. The larva of the [blue mud wasp](#) hatches from an egg placed among the stored [spiders](#) in a cell of the [black and yellow mud dauber nest](#) and it feeds not only on the [spiders](#), but on the ill-fated, immature [mud dauber](#) as well. The [blue mud wasp or blue mud dauber](#) is, therefore, a direct enemy of the [black and yellow mud dauber](#) and an indirect friend of [spiders](#) and of mankind. No more beneficial creatures exist in the wild than the specifically and individually numerous [araneids](#).

This process of perpetuation is an easy one for the usurper. There is no nest to labor over, no hunting to do, not even the mud cells to seal up. The job is as simple as that of the [cuckoo](#) of the Old World and the [cowbird](#) of America. What, then, can limit the numbers of these interlopers, or prevent the extinction of all the mason wasps? Take it for granted that Nature directs the result of the preying, killing, usurping habit.

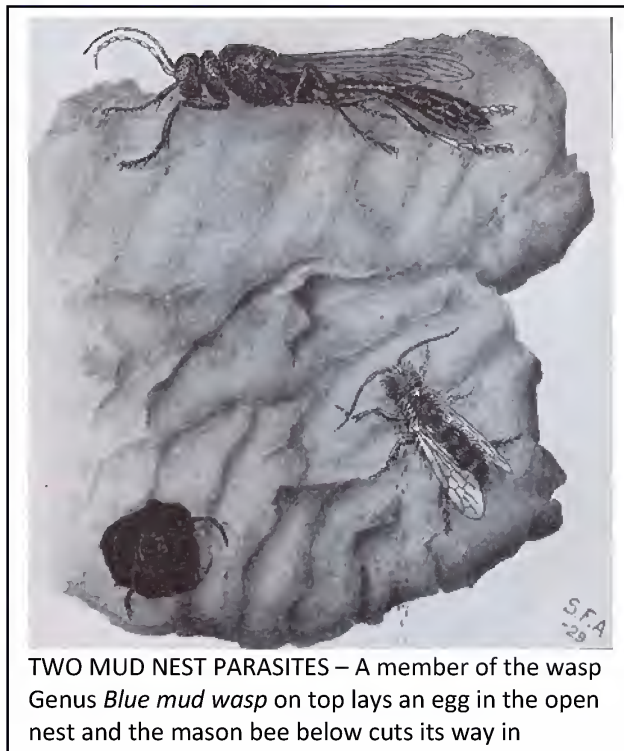
Looking a little more closely it becomes surprising that investigators long since have not observed the little round holes filled with discs of different colored clay in the [mud nests](#) of the mason wasps, and have not surmised that a burglar, rather than a mere sneak thief or a trespasser, has been at work.

Break open a cell having this peculiar mark and within reposes a cocoon of the [blue mud wasp](#). It has been broken open at one end and this filled solidly with a thick plug of the same clay that closes the once made hole in the cell wall. And the larva of the [blue mud wasp](#) no longer exists within; instead a small, gray-brown, ovoid cocoon crisply soft and within it a larva most surely not a wasp occupies the space behind the plug.

From this in time emerges a dull blue, round-bodied [bee](#) largely covered with white hairs-[Osmia lignaria](#). The generic name means an odor, though this little insect, not over five-sixteenths of an inch in length and half as broad, has no discernible smell. The specific name, as is so frequently the case, is another result of error, for the species, unlike several others of the genus, does not work in wood, but only in clay in order to close up its enforced entrances against further enemies that may damage its offspring. This species of [Osmia](#) has also been called a [mason bee](#) by those who knew them better.

Here is presented an apparent curiosity. Whenever the enforced infestation of [Osmia](#) takes place it seems to be only upon the [blue mud wasp](#). Wherever that interloper has inserted its presence the watchful little [bee](#) seems to know about it and, particularly in certain sections, gets busy long enough after to permit the [blue mud wasp](#) to have reached the pupal stage. Out of more than a score of cells bored into by [Osmia](#) I found always that the [blue mud wasp](#) had usurped the premises. But only once and then for the briefest moment before the [bee](#) was frightened away have I caught it at work cutting into the mud nest cell and, oddly, it did not come back before my patience was exhausted. Here, then, we have an insect that destroys an enemy of [Chalybion](#) and [Sceliphron](#), thus indirectly aiding also in limiting the number of [spiders](#) and therefore it may be looked upon with some doubt by the agriculturist.

But we may extend our inquiries still further, nor here to discover more parasites, whether friends or foes, but to record that among all of them there is a complicated criss-crossing of infestation. Thus the spores of fungus may drift in and destroy the larva of the [cuckoo wasp](#), the [blue mud wasp](#), the [Tachina](#) or the [Osmia](#). [Chrysis](#) may also infest the [blue mud wasp](#), the [bee](#) and possibly the [Tachina](#); the latter is no respecter of species, extending its parasitism to anything that will afford sustenance to its maggot-like young.



An extensive examination of [mud dauber](#) nests shows that the percentages of infestation average about one in four or five, though in sections it considerably exceeds this. Where the [blue mud wasp](#) selects a cell in which to deposit her egg she is apt to hang round there and use each one of several as they are completed and stored. The same may be said of [Chrysis](#). It is not surprising that the interlopers are generally successful in their nefarious efforts, for the **mason wasps** have to spend much time in hunting and often have to go long distances for the mud to seal up the cell. Is it nor strange, however, that with their powerful scent organs they cannot detect the infesting eggs of the parasites?

[Osmia](#) also is persistent; discovering the hidden infestation of the [blue mud wasp](#), by scent alone, she proceeds to burglarize every cell in one nest before seeking others. Nature does not always direct her efforts to produce the best results. It is evident that [Tachina flies](#) just emerging within the cells, also the fungus spores, cannot escape through the thick walls of the mud nests, though the spores may retain life until the cell walls become disintegrated. The fly, eager to deposit her eggs, foolishly enters that which will prove to be a prison death house to her offspring. With the developing [blue mud wasp](#), the [cuckoo wasp](#) and, of course, the [Osmia](#) it is quite different; their jaws are as strong as those of the newly-emerging **mud dauber**. And thus goes the story.

[Samuel Francis Aaron](#) (1862-1947) is also known in print as **S. Frank Aaron** or **S. F. Aaron**. He was a naturalist who was the first editor of the *Entomological News*, custodian of insects in the Entomological Section at the Academy of Natural Sciences of Philadelphia (1884-1885), economic entomologist at the Philadelphia Commercial Museum (1896-1906+), published widely in *Entomology*, having named numerous species new to science. Later, he was a writer of popular nature articles for newspapers and magazines. He also wrote for the Radio Boys young adult series of books

This article was reprinted from:

Aaron, S.F. 1930. Fateful Fortunes Of The Mason Wasps: Friends And Foes Make Life Complicated. *Nature Magazine*, Washington, DC. 16(1): 38-42. Note: *Nature Magazine* was published by The American Nature Association. [Ed. Note: Extensive modifications to update taxonomy and common names were made to the title as well as the article. Other modifications made in order to accommodate formatting. Additional bio for the author created by the editor.]

CHAPTER NEWS

Falls of the Ohio Chapter Events (see front cover for regular meeting times and place, field trip times may be found below or are to be determined. Contact Chapter President **Chris Bidwell** at (502) 896-4834 or via email at: mabteacher1@yahoo.com for more information. Please send photos for viewing at the meetings to Coordinator **Susan Wilson** via email at (susanfltrn@yahoo.com).

2011 Dates	Event/Speaker or Leader	Topic / Outing
February 15	Pat Meyer	Winter Tree I.D. Walk – 9:00-11:00 AM @ Cherokee Park, Barringer Trailhead by Frisbee field
February 16	Margaret Shea	Gardening with Native Plants – 7:00 PM @ Louisville Nature Center

KENTUCKY NATURALISTS' CALENDAR

(added as space and time allow)

2012:

January 8, 2012: Owl Prowl @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (3:30 p.m. -). See the amazing birds active around dusk. Visit hot-spots within Bluegrass FWA's surrounding area. Bring your camera or binoculars and see avian predators like Short-eared Owls, Great Horned Owls, Prairie Merlins, Rough-legged Hawks, Northern Harriers, Bald Eagles, and Red-tailed Hawks. If you don't have binoculars, Wild Birds

Unlimited will have loaners. Dress warmly. Meet at the main boat ramp/information station at Bluegrass Fish and Wildlife Area (Warrick Co., IN), 1/2 mile east of the Boonville-New Harmony Road/Interstate I64 Intersection (exit 15). Program fee: Free. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

January 11, 2012: Children's Program: Let It Snow! --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (10 AM). Snow, frost, and ice, oh my! Discover signs of winter by taking a walk in The Arboretum looking at trees and animal homes, then warm up inside with story time. Children will make a winter scene to take home. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

January 22, 2012: Owl Prowl @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (3:30 p.m. -). See the amazing birds active around dusk. Visit hot-spots within Bluegrass FWA's surrounding area. Bring your camera or binoculars and see avian predators like Short-eared Owls, Great Horned Owls, Prairie Merlins, Rough-legged Hawks, Northern Harriers, Bald Eagles, and Red-tailed Hawks. If you don't have binoculars, Wild Birds Unlimited will have loaners. Dress warmly. Meet at the main boat ramp/information station at Bluegrass Fish and Wildlife Area (Warrick Co., IN), 1/2 mile east of the Boonville-New Harmony Road/Interstate I64 Intersection (exit 15). Program fee: Free. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

January 26, 2012: Incredible Plants A to Z @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (6:00 PM). Todd Rounsaville will highlight 26 of the world's most astonishing plants. From Amorphophallus, the bizarre bulb which has the largest flower on earth, to Zea mays, the phenomenal species that gives us popcorn, fuel, and plastic. Cost: \$5/Friends of the Arboretum: \$4. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

January 27, 2012: Walk on the Wild Side-Nature Programs for Toddlers - Winter Treats @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). Toddlers 3-5 years old. 45 min - 1 hr interactive program will explore what nature has to offer. With each new topic toddlers will discover how wildlife and nature shapes the world we live in. Each program involves one or more activities including games, crafts, live animal visit, hike, or songs. Program fee: \$2.00 per person per session. Pre-registration is required. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

February 2, 2012: Children's Program: Junior Naturalist - Winter Hideaways --Ages 7-11 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Discover how animals and people stay warm in winter, take a weather observation hike, and make icicles. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 4, 2012: Children's Program: Oh Deer! --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (11:00 AM). What is a habitat? We will take a walk outdoors looking for spaces that animals call their home. Then we'll come inside for story time and make a deer craft to take home. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 5, 2012: Owl Prowl @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). See the amazing birds active around dusk. Visit hot-spots within Bluegrass FWA's surrounding area. Bring your camera or binoculars and see avian predators like Short-eared Owls, Great Horned Owls, Prairie Merlins, Rough-legged Hawks, Northern Harriers, Bald Eagles, and Red-tailed Hawks. If you don't have binoculars, Wild Birds Unlimited will have loaners. Dress warmly. Meet at the main boat ramp/information station at Bluegrass Fish and Wildlife Area (Warrick Co., IN), 1/2 mile east of the Boonville-New Harmony Road/Interstate I64 Intersection (exit 15). Program fee: Free. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

February 8, 2012: Founders Lecture: "Uprooting Conventional Wisdom in the University Arboretum" by George Briggs @ Gluck Equine Center Auditorium, 1400 Nicholasville Road, Lexington, KY 40503 (7:00 PM). Founders Lecture Series presents George Briggs, Executive Director of the North Carolina Arboretum (434 acres) in Asheville, since 1987. He was also president of the

American Association of Botanical Gardens and Arboreta, and chaired the first World Botanic Gardens congress. Cost: \$5/Friends of the Arboretum: FREE. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 9, 2012: Children's Program: Junior Naturalist - Tree Detective --Ages 7-11 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Learn clues that naturalists use to identify trees during winter and "adopt" a tree to study all year. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 14, 2012: Children's Program: Love the Earth! --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (10:00 AM). Celebrate love for the earth on Valentines' Day. Make a terrarium of green plants to take home and nurture. Bring a container appropriate for a small terrarium; we'll provide the plants. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 16, 2012: Children's Program: Junior Naturalist - Flying Adventures --Ages 7-11 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Birds sometimes have a difficult time finding food in the winter. Bring a carton to transform into a bird feeder for your backyard. We'll learn some techniques birders use to identify our feathered friends. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 18, 2012: Cabin Fever Festival @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (10:00 a.m. - 4:00 p.m.). Tired of winter? Come to the Interpretive Center for a day of activities, arts & crafts. Make a pinecone bird feeder, a colorful paper bouquet / sculpture, pet rock, and more! For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

February 19, 2012: Owl Prowl @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). See the amazing birds active around dusk. Visit hot-spots within Bluegrass FWA's surrounding area. Bring your camera or binoculars and see avian predators like Short-eared Owls, Great Horned Owls, Prairie Merlins, Rough-legged Hawks, Northern Harriers, Bald Eagles, and Red-tailed Hawks. If you don't have binoculars, Wild Birds Unlimited will have loaners. Dress warmly. Meet at the main boat ramp/information station at Bluegrass Fish and Wildlife Area (Warrick Co., IN), 1/2 mile east of the Boonville-New Harmony Road/Interstate I64 Intersection (exit 15). Program fee: Free. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

February 23, 2012: Children's Program: Junior Naturalist - Nature Nurturer --Ages 7-11 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Explore the importance of the native ecosystems of Kentucky. Go on a native plants walk, make a terrarium out of re-used materials, become an earth steward. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 24, 2012: Walk on the Wild Side-Nature Programs for Toddlers - Wiggly Worms @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). Toddlers 3-5 years old. 45 min - 1 hr interactive program will explore what nature has to offer. With each new topic toddlers will discover how wildlife and nature shapes the world we live in. Each program involves one or more activities including games, crafts, live animal visit, hike, or songs. Program fee: \$2.00 per person per session. Pre-registration is required. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

March 4, 2012: Children's Program: Make a Milk Carton Birdhouse --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (2:00 & 4:00 PM). Bring your own carton. Weather permitting and ONLY if the KCG is open. Cost: \$3/KCG members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 7, 2012: Little Sprouts Program: Windy Weather --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Make a pinwheel and hear a story about weather. Help us plant seeds indoors to transplant in the KCG. Cost: \$3/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 9, 2012: Walk on the Wild Side-Nature Programs for Toddlers - Tree Mural @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). Toddlers 3-5 years old. 45 min - 1 hr interactive program will explore what nature has to offer. With each new topic toddlers will discover how wildlife and nature shapes the world we live in. Each program involves one or more activities including games, crafts, live animal visit, hike, or songs. Program fee: \$2.00 per person per session. Pre-registration is required. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

March 10, 2012: Children's Program: Story time in the Garden --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (11:00 AM & 2:00 PM). Weather permitting and ONLY if the KGC is open. Cost: \$3/KGC members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 11, 2012: Children's Program: Make a Flower --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (2:00 & 4:00 PM). Weather permitting and ONLY if the KGC is open. Cost: \$3/KGC members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 14, 2012: Little Sprouts Program: Feathered Friends --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Discover what makes birds so special. Take a short hike to look for birds and make a nest to take home. Cost: \$3/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 17, 2012: Children's Program: Green is the Thing! --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (11:00 AM & 2:00 PM). Make a four-leaf clover. Weather permitting and ONLY if the KGC is open. Cost: \$3/KGC members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 18, 2012: Children's Program: Puddles, Ponds and Polliwogs --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (2:00 & 4:00 PM). Weather permitting and ONLY if the KGC is open. Cost: \$3/KGC members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 20, 2012: Riparian Zone Restoration @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (10:00 AM-noon). Instructors: Carmen Agouridis and Amanda Gumbert. Riparian buffers offer a number of ecosystem benefits related to water quality, stream bank stabilization, and habitat. They slow and capture runoff, which can improve water quality by trapping and filtering pollutants such as sediment, nutrients, and pesticides. We'll cover the main concepts behind the benefits of riparian buffers, removal of invasive plants, selection of native plants, planting, and maintenance. Cost: FREE. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 21, 2012: Little Sprouts Program: Little Critters --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Learn about our insect pals and about metamorphosis. Make a butterfly to take home. Cost: \$3/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 22, 2012: Founders Lecture: "Native Flowers, Shrubs, and Trees Attractive to Honey Bees" by Tammy Horn @ Gluck Equine Center Auditorium, 1400 Nicholasville Road, Lexington, KY 40503 (7:00 PM). Founders Lecture Series presents George Briggs, Executive Director of the North Carolina Arboretum (434 acres) in Asheville, since 1987. Eastern Kentucky University professor Dr. Tammy Horn is an apiculturist, a scholar of bee keeping. She is author of two books: *Bees in America: How the Honey Bee Shaped a Nation* (2005) and *Beeconomy: What Women and Bees Can Teach us About Local Trade and The Global Market* (2011). Cost: \$5/Friends of the Arboretum: FREE. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 23, 2012: Walk on the Wild Side-Nature Programs for Toddlers - Who Lives in a Tree @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). Toddlers 3-5 years old. 45 min - 1 hr interactive program will explore what nature has to offer. With each new topic toddlers will discover how wildlife and nature shapes the world we live in. Each program involves one or more activities including games, crafts, live animal visit, hike, or songs. Program fee: \$2.00 per person per session. Pre-registration is required. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

March 31, 2012: Children's Program: Beginner Birding --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (11:00 AM & 2:00 PM). Make a four-leaf clover. Weather permitting and ONLY if the KCG is open. Cost: \$3/KCG members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

April 14, 2012: Raptor Day @ Charlestown State Park, in Indiana, 1 mile east of the intersection with Hwy 3 (Charlestown) on Hwy 62 (turn right) (10:00 a.m. to 4:00 p.m.). Learn about birds of prey and bird watching. Hardy Lake Raptor Rehab Center will bring several of their birds for visitors to see up-close. Telescopes will be set up to observe birds in their native habitat. Non-live raptor programs guided by Naturalist at Heart Volunteers from the Falls of the Ohio State Park. There will be plenty of bird-watching opportunities, owl pellet dissection, children's activities, and more! Gate fees apply - \$5 per vehicle, Indiana residents, \$7 per vehicle, non-residents, FREE for Indiana State Park card holders. Programs are free with admission. For more information visit their website (combined with Falls of the Ohio State Park) at <http://www.fallsoftheohio.org/>, write them at P.O. Box 38, Charlestown, IN 47111, or call them at (812) 256-5600.

April 20-22, 2012: Kentucky Society of Natural History 2012 Spring Meeting @ Shepherdsville, KY. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

April 25-29, 2012: Ohio Valley Birding Festival @ multiple locations in southwestern Indiana and western Kentucky. The Ohio Valley Birding Festival is an Evansville Audubon Society event in partnership with Indiana's Wesselman Nature Society and Kentucky's John James Audubon State Park. The events feature guided spring migratory bird watching hikes. Areas featured for guided tours include Goose Pond Fish and Wildlife Area; Bluegrass Fish and Wildlife Area; Wesselman Woods Nature Preserve; Eagle Slough Natural Area; John James Audubon State Park; Lincoln State Park; Squaw Creek Mine; Howell Wetlands; Cane Ridge Unit of Patoka River National Wildlife Refuge including Lake Gibson; Oakland City Unit of the Patoka River National Wildlife Refuge; Twin Swamps Nature Preserve; New Harmonie State Park; and a canoe trip to Hovey Lake. A "Big Day" of birding will be offered for the more adventuresome birders. There is also a Family Day at Wesselman Woods Nature Center where members of the Evansville Audubon Society and Southwest Indiana Master Naturalists present a fun-filled day for the whole family! There are games, hands-on displays, workshops and lots and lots of fun for everyone, featuring over a dozen "birdy" activities that include making binoculars, a scavenger hunt, Bird Olympics, making a bird feeder, and planting seeds that will attract birds to your yard. All Family Day activities are FREE to the public. The Key Note speaker for 2012 will be Chuck Mills. He will speak at the EVSC Career Center Assembly Hall in Evansville, IN. Chuck has been an avid birder since the late 1960's. His world list stands at nearly 2000 and he has an ABA (American Birding Association) list of 675. He has birded in all 50 states as well as Panama, Costa Rica, Ecuador, Mexico and 22 other countries around the world. For nearly 20 years, he has monitored the federally-endangered Least Tern population at Cane Ridge in Gibson County. This is only one of two nesting sites for the state of Indiana. He has watched the Least Tern population in Indiana increase from just 2 birds in 1986 to the over 300 that were present in 2011. Chuck is on the board of directors of the Indiana Audubon Society. He has given bird-related talks at numerous schools and organizations. For more information contact each of the following: 1) Evansville Audubon Society - 551 North Boeke Road, Evansville, IN 47711, <http://www.evvaudubon.org>. 2) Wesselman Woods Nature Preserve - 551 North Boeke Road, Evansville, IN 47711, (812) 479-0771, <http://www.wesselmannaturesociety.org/>. 3) John James Audubon State Park - 3100 US Highway 41 N Henderson, KY 42420-2055, (270) 826-2247, <http://parks.ky.gov/parks/recreationparks/john-james/>. The festival website is <http://ohiovalleybirdingfestival.org>. If you would like to volunteer to help with any of these activities, please contact Evansville Audubon Society's LD Harry at 812-867-0144.

April 25-29, 2012: Spring Wildflower Pilgrimage @ Great Smoky Mountains National Park, Mills Conference Center, 303 Reagan Drive, Gatlinburg, TN 37738. This is an annual five-day event in Great Smoky Mountains National Park (GSMNP) consisting of a variety of wildflower, fauna, and natural history walks, motorcades, photographic tours, art classes, and indoor seminars. Most programs are outdoors in GSMNP, while indoor offerings are held in various venues throughout Gatlinburg, TN. For more information send email to springwildflowerpilgrimage@gmail.com, or visit the website at <http://www.springwildflowerpilgrimage.org/>.

April 27, 2012: Walk on the Wild Side-Nature Programs for Toddlers - Pecking Proficiency @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). Toddlers 3-5 years old. 45 min - 1 hr interactive program will explore what nature has to offer. With each new topic toddlers will discover how wildlife and nature shapes the world we live in. Each program involves one or more activities including games, crafts, live animal visit, hike, or songs. Program fee: \$2.00 per person per session. Pre-registration is required. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

April 27-29, 2012: The Kentucky Ornithological Society's Spring Meeting @Kentucky Dam Village State Resort Park, Gilbertsville, KY. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.eku.edu/kos/birding.htm>.

May? ___, 2012: Herpetology Weekend @ Natural Bridge State Resort Park, 2135 Natural Bridge Road, Slade, KY 40376-9701, (7:30 a.m. to 9:30 p.m.). Discover nature's most misunderstood critters! Experienced herpetologists will lead field trips into the [Red River Gorge Geological Area](#) to observe reptiles and amphibians in their native habitat. Most Saturday fieldtrips will be offered at 9:00 a.m. and 1:30 p.m. Collection is prohibited. Friday and Saturday evening presentations will focus on reptile and amphibian natural history and conservation. Some demonstrations will include live venomous snakes! Registration fee upon arrival. \$10/adult, \$3/ages 13-17, and free for ages 12 and under. For more information contact Tyler Morgan at tyler.morgan@ky.gov.

May 11 - 13, 2012: The Art and Science of Nature Journaling @ Pine Mountain Settlement School, 36 Highway 510, Pine Mountain, KY 40810. Betty Beshoar, visual artist, will team with Heather Housman, former botanist with the Kentucky State Nature Preserves Commission, to conduct the workshop. During walks on Settlement School property, they will describe and answer questions about trees, plants, birds and insects found on the way. With this information, participants will create their own nature journals, which include writing, drawing and water coloring. Nature journaling is a powerful tool to use in connecting more deeply with the natural world. This workshop is suitable for all skill levels. Beginners are welcome. Enrollment is limited to 12 people. Cost: \$250 and includes meals from Friday dinner through Sunday lunch, two nights lodging and all instruction. For more information, contact the Pine Mountain Settlement School at 606-558-3571 or 606-558-3542. You can also visit their website at <http://www.pinemountainsettlementschool.com/>.

May 12, 2012: Earth Day @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (10:00 a.m. to 4:00 p.m.). The Falls of the Ohio State Park will buzz with activity. Environmentally minded businesses and organizations from all over the region gather to share information, show off their accomplishments, and provide fun for the whole family. Special programs include live animals, children's activities, and more! Sponsored by Jamey Aebersold Jazz, Kentuckiana Air Education, The Trash Force, and The Falls of the Ohio Foundation. FREE ADMISSION!!! For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

May 12, 2012: Earth Day @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (10:00 a.m. to 4:00 p.m.). The Falls of the Ohio State Park will buzz with activity. Environmentally minded businesses and organizations from all over the region gather to share information, show off their accomplishments, and provide fun for the whole family. Special programs include live animals, children's activities, and more! Sponsored by Jamey Aebersold Jazz, Kentuckiana Air Education, The Trash Force, and The Falls of the Ohio Foundation. FREE ADMISSION!!! For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

July 27-29, 2012: Midwest Native Plant Society's 4th Annual Midwest Native Plant Conference @ Bergamo Center, 4400 Shakertown Road, Dayton, OH 45430-1075. Join the Midwest Native Plant Society at their 4th annual meeting where a variety of recognized experts will speak and present field trips to explore native plants and wildlife in landscaping, forests, wetlands, and prairies. Speakers include: Ian Adams, environmental photographer, presenting "Gossamer Wings - The World of Dragonflies and Damselflies"; Marielle Anzelone, Urban Plant Ecologist in New York City, on greening the urban environment through ecosystem stewardship; David Wagner, entomologist and a professor of ecology and evolutionary biology, will talk about Caterpillars. He is also the author of Caterpillars of Eastern North America. After Wagner's talk there will be a field trip with mercury vapor lights and flashlights to find some caterpillars often only seen at night. There will be breakout sessions by recognized and informative speakers: Michelle Banker, David Brandenburg, Wes Duran, Don Geiger, Cheryl Harner, Jan Hunter, Jim McCormac, Carol Mundy, Tara Poling and Stan Stine. There will also be vendors with a variety of related items. For more information see their website at <http://www.midwestnativeplants.org/>, email them at mwnpsconference@gmail.com or call (513) 941-6497. There will be limited

lodging at the Bergamo Center but other options are available. For lodging information go to <http://www.midwestnativeplants.org/Flyers/Lodging2011.pdf>.

August 4, 2012: Family Fun Fair @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (10:00 a.m. - 4:00 p.m.). Need a diversion before school starts? This event will keep the kid's (age 3 – 14) active and learning for hours! Join us inside the air conditioned Interpretive Center for a sampling of activities from all of our annual events. Meet Seaman the Newfoundland and get his 'pawtograph,' dissect and owl pellet, examine fossils, make and take your own sculpture from driftwood, do an 'Earth Day' scavenger hunt and more! Free with regular admission. Sponsored by the naturalists of the Naturalists at Heart volunteer program at the park. For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

September 22, 2012: Charlestown Under the Stars @ Charlestown State Park, in Indiana, 1 mile east of the intersection with Hwy 3 (Charlestown) on Hwy 62 (turn right) (10:00 a.m. to 4:00 p.m.). Co-sponsored by the Louisville Astronomical Society, this event will focus on stargazing. What is out under the night sky tonight? Learn about telescopes, how to find Polaris, discover the October constellations, bring your telescope that you haven't figured out how to use and learn how. If weather is overcast, the event will be held in the park office with an astronomy slide show and telescopes for examination. Gate fees apply - \$5 per vehicle, Indiana residents, \$7 per vehicle, non-residents, FREE for Indiana State Park card holders. Programs are free with admission. Staffs at the Falls of the Ohio and Charlestown State Park have merged. As a result, programs and events at Charlestown will be coordinated by the same people. Coordinated by Alan Goldstein (agoldstein@dnr.in.gov). For more information visit their website (combined with Falls of the Ohio State Park) at <http://www.fallsoftheohio.org/>, write them at P.O. Box 38, Charlestown, IN 47111, or call them at (812) 256-5600.

September 28-30, 2012: The Kentucky Ornithological Society's Fall Meeting @ Mammoth Cave National Park, KY. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.uky.edu/kos/birding.htm>.

September 29, 2012 (TENTATIVE): Rock the Rocks @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (6:00-10:00 p.m.). More details to come! For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

October 13, 2012: Earth Discovery Day @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (9:30 a.m. - 5:30 p.m.). This new event will focus on the world beneath your feet. It coincides with Earth Science Awareness Week and events across the nation. The park is planning a variety of interactive activities for adults and children. Inside the museum will be children's rock-craft activities. There will be fascinating geoscience speakers. Discover geology through a microscope with microfossils and microminerals. Learn how to photograph specimens (helpful if you want to get something identified by e-mail) and how to display them in your home or office. Free brochures from almost every fossil park in North America will be available. Teachers can sign up and win a 50, 75 or 100 piece geology collection. There will be free rock and fossil identification so bring in your unknowns! Outside there will be fossil and mineral dig piles, guided outer and Indiana shore fossil bed hikes. A surprise interactive exhibit is planned. Stay tuned for news in early 2012. Participating Organizations: Falls of the Ohio Foundation, Kentucky Paleontological Society, Indiana Society for Paleontology, Mineral And Fossil Interest Club (MAFIC), Indiana Geological Survey, Kentucky Geological Survey, KYANA Geological Society. Free with regular admission. For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

October 12-14 or 19-21, 2012: Kentucky Society of Natural History 2012 Fall Meeting @ [Pine Mountain State Resort Park](#). See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

2013:

April 26-28, 2012: Kentucky Society of Natural History 2012 Spring Meeting @ Pine Mountain State Park. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

April 26-28, 2012: The Kentucky Ornithological Society's Fall Meeting @ Carter Caves State Park, KY. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.uky.edu/kos/birding.htm>.

The mission of the **Kentucky Society of Natural History (KSNH)** is to actively promote study and interest in Kentucky's rich natural heritage throughout the Commonwealth. Members are typically interested in a broad spectrum of natural sciences and related fields. Among the more prominent activities of the KSNH, are the annual spring and fall Conferences, selection of a "Naturalist of the Year", nature photography contests, research grants, and a variety of knowledgeable speakers and field trips. We invite anyone who shares our interests to **join us**.

For membership information or to submit dues please contact:

Kentucky Society of Natural History, P.O. Box 883, Fairdale, KY 40118-0883,

or visit our website <<http://www.ksnh.org>> for the membership form. Membership dues are:
Individual \$15, Family \$25, Full Time Student \$7.50, Lifetime: \$300.

The Kentucky Society of Natural History is an official 501(c) (3) tax-exempt nonprofit organization which was formed in 1939, and incorporated in 1943 in Louisville, Kentucky. All contributions to THE KENTUCKY SOCIETY OF NATURAL HISTORY are tax-deductible to the full extent of federal and state income tax laws.

Published quarterly, The [Kentucky Naturalist News](#) is the official newsletter of KSNH. Unsolicited contributions are encouraged. Please send articles to: **Barry Nichols, KNN Editor, P. O. Box 21182, Louisville, KY 40221.** You can also email newsletter submissions by sending them to kyfauna@iglou.com.

Kentucky Naturalist News Deadlines & Schedule:



<u>Issue</u>	<u>Deadline</u>	<u>Tentative Publish Date</u>
Spring Issue	February 1, 2012	March 1, 2012
Summer Issue	May 1, 2012	June 1, 2012
Fall Issue	August 1, 2012	September 1, 2012
Winter Issue	November 1, 2012	December 1, 2012

For submissions, plan on 0.5-inch margins, 10 pt Arial or Calibri font, and about 2 photos per page. Please leave the photo images in full-size and do not optimize them. Please cite references. To assist, you may use: <http://www.lib.ncsu.edu/lobo2/citationbuilder/citationbuilder.php>.



Kentucky Society of Natural History
P.O. Box 883,
Fairdale, KY 40118-0883

Formed 1939,



Incorporated 1943

Kentucky Naturalist News

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Volume 69, Number 4, Winter 2011



Website: <http://www.ksnh.org>

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Grants: Wally Roberts (waldonroberts@bellsouth.net)

Geology:

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Historian:

Hospitality: Cynthia Payne (cpayne_ksnh@yahoo.com)

Invertebrate:

Mammalogy: Mark Gumbert

(mwgumbert@copperheadconsulting.com)

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Photography: Susan Wilson (susanfltrn@yahoo.com)

Publicity:

Youth Activities:

Board Members at Large

Berl Meyer (geology@ksnh.org)

Affiliated Chapters

Arches of the Cumberland Chapter (Slade) meets informally, call President Dell Sasser for details, 606-666-7521 x73559, or (606) 233-8938, or via email (dell.sasser@kctcs.edu)

Falls of the Ohio Chapter (Louisville), 9109 Hawthorne Pointe Drive, Louisville, KY 40272, meets every 3rd Thursday of each month except Jan, Jul, Aug, & Dec at 7:00 PM at the **Louisville Nature Center**, 3745 Illinois Ave, Louisville, 40213. Call President Chris Bidwell at (502) 458-1328, or via email (mach5049@gmail.com).

Wilderness Trail Chapter (Pineville) meets the first Thursday of each month, March through December, at 7:00 p.m., generally at Pine Mountain State Resort Park in the Ray Harm Room, 1050 State Park Road Pineville, KY 40977-0610 (800-325-1712). Call President Tom Toole at (606) 248-3078, or via email (tom.tdoole@gmail.com).



A female *Odocoileus virginianus* (Zimmermann, 1780) (white-tailed deer) in Edmonson County, Kentucky. Photo by Barry Nichols, 2011, Nikon Coolpix P100.

EDITOR'S NOTES

As noted in the Fall 2011 Kentucky Naturalist News (KNN), with this issue I end my tenure as KSNH editor. I again offer thanks to everyone for making it pleasurable and memorable to serve. That said, I'm happy to announce the KSNH has a new editor starting in 2012. Her name is [Gretchen Fitzgerald](#). Please welcome her and feed her a lot of newsletter copy so that she can start the 70th volume of KNN with a healthy stack of material she can use to plan out her first year.

I'd like to also welcome the new board for the 2012 through 2013 term. They are as follows:

Officers 20120 through 2013

President: Jeff Foster
Vice Pres.: Chris Bidwell
Secretary:
Treasurer: Pat Meyer
Editor: Gretchen Fitzgerald
Past Pres.: Zeb Weese
Webmaster: Dave Luzader

Coordinators 20120 through 2013

Astronomy:
Environmental Ed.:
Field Trips: James Kiser
Grants: Wally Roberts
Geology:
Herpetology: John MacGregor
Historian:
Hospitality: Cynthia Payne
Invertebrate:
Mammalogy: Mark Gumbert
Naturalist of the Year: Wally Roberts/Joe Settles
Photography: Susan Wilson
Publicity:
Youth Activities: Daniel Foster

Board Member at Large 20120 through 2013

Berl Meyer

Your Society needs you. Please consider volunteering to fill one of the vacant slots on the board.

Newly-elected President Jeff Foster sends in his greetings later this issue. **Travis Brown**, coauthor of the recently published [Pocketguide to Eastern Streams](#) writes about aquatic snails. I dug up a snowflake article from 1930 just in case we get some snow. Don't forget the KSNH Spring Conference at Shepherdsville, KY, April 20 - 22, 2012. The registration form is inside the back cover in this issue, or you can also find it on the [KSNH website](#).

Pat Meyer, our Treasurer, would like to remind people that it may be time for dues payments. Dues payments are now [easily made online](#) via our website and the back page of this newsletter now has links in the dues area to aid. Additionally, the QR Code in the dues box on the back page will allow you to pay dues via your smart phone. The QR Code in the newsletter masthead just takes you to the front of our webpage.

We're having yet another mild winter. In fact, we may have had about a day-and-a-half of winter weather thus far. On January 31, 2012 I saw my first groundhog of the year in Frankfort, KY!

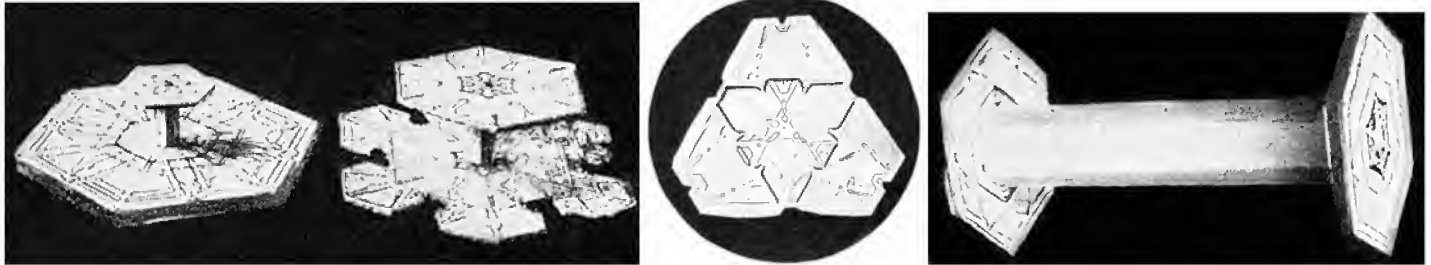
ERRATA: In the [Fall 2012 Kentucky Naturalist News](#), there was a tree quiz by Chris Bidwell. There was a problem with the answers that I will correct in the online edition. These corrections are also shown here for those who might want them before the corrections get made in the online version. The corrected answers are: **1-alder, 2-apricot, 3-ash, 4-aspen, 5-beech, 6-cottonwood, 7-chestnut, 8-coffee, 9-catalpa, 10-gingko, 11-holly, 12-osage orange.**

Please remember that the deadline for the Spring 2012 issue of the Kentucky Naturalist News is February 1, 2012. All submissions for that issue should go to [Gretchen Fitzgerald](#) (contact information above) –barry

SNOW FLAKES: IN THE MAKING OF WHICH NATURE SHOWS HER GREATEST ARTISTRY

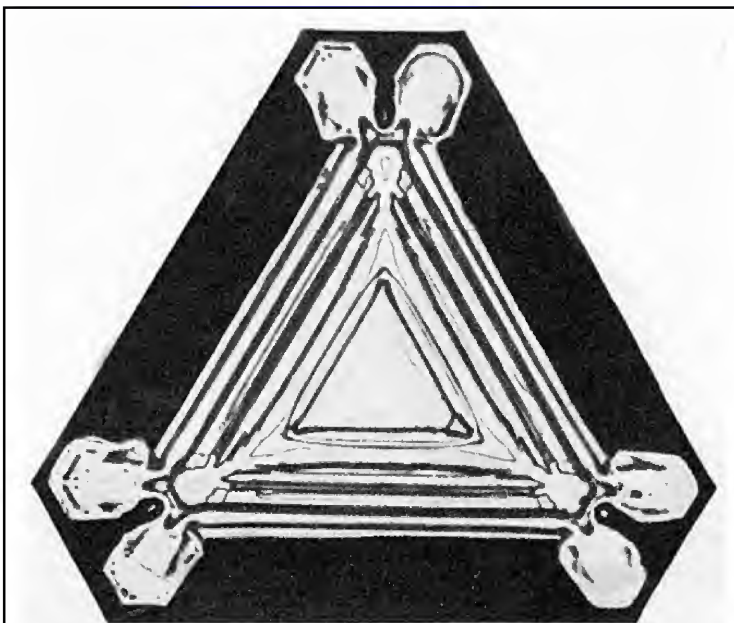
by Constance L. Lyon

Illustrated with the photographs of Dr. Wilson A. Bentley



MARVELS OF JACK FROST-ARTIST: at the left the wondrous cuff-button, at center the snow flake appears similar to a Masonic emblem, and at the right a "bobbin".

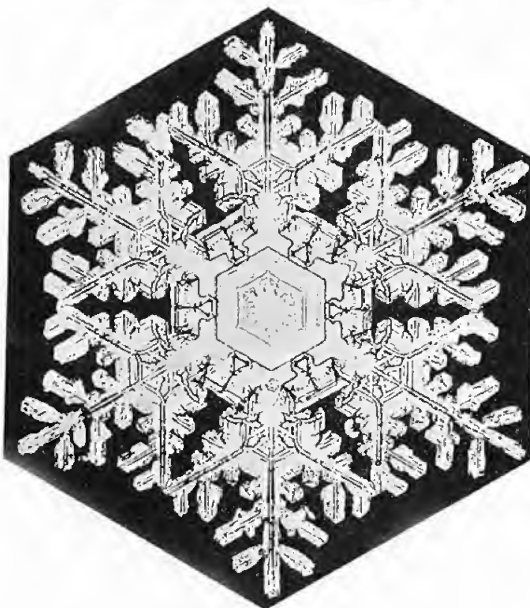
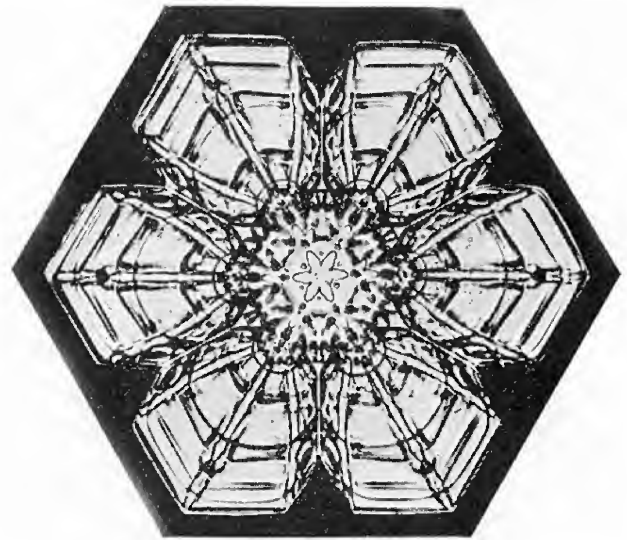
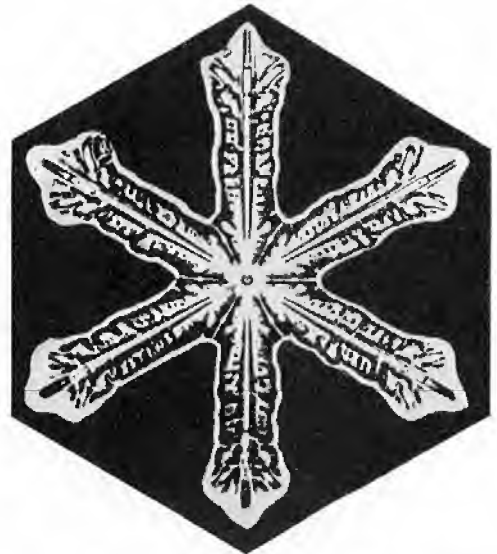
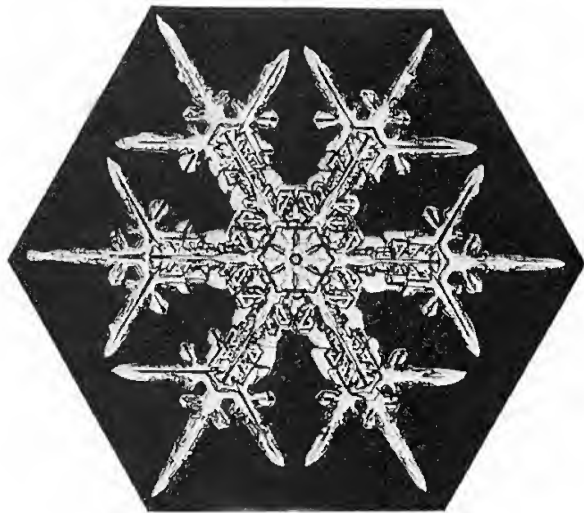
It is to a farm boy's love of the [snowflake](#) that [science](#) owes its knowledge of these gems. The child's interest was born on the memorable day that brought him a [microscope](#). Then he entered fairyland, and began to peep at Nature's hidden treasures--the wing of a [butterfly](#), a bit of [moss](#), and many a strange little [insect](#). But it was [winter](#) that brought him triumph, because then he caught a [snow flake](#). Its beauty fascinated him and set his heart paining with desire that all the world might see it as he saw it. Longing led to dreaming dreams that were to come true, because his mind hit upon a way to [photograph snow flakes](#).



A FLAKE THAT SIGNS ITSELF "THREE": Most snow flakes are six-sided but here is one of the rarer variety.

Boylike, he said nothing about it, only pleaded for a camera and a powerful magnifying lens, a lens that would magnify many thousands of times. [Christmas](#) brought both. In a few weeks, lens fitted to the camera, he was ready to [photograph snow crystals](#) magnified three thousand six hundred times. A workshop outdoors, where the temperature would stand at freezing, was quickly built.

The first [snow](#) flurry saw a board covered with black velvet placed invitingly in the open air. A [snowflake](#) fell lightly to rest. The boy darted forward. Holding his warm breath lest the crystal melt, he seized a sharp-pointed stick, and with a light, sure touch gently lifted the crystal from the board to the camera slide. In the twinkling of an eye, a single [snowflake](#) evaporates, but he snapped the camera in time.

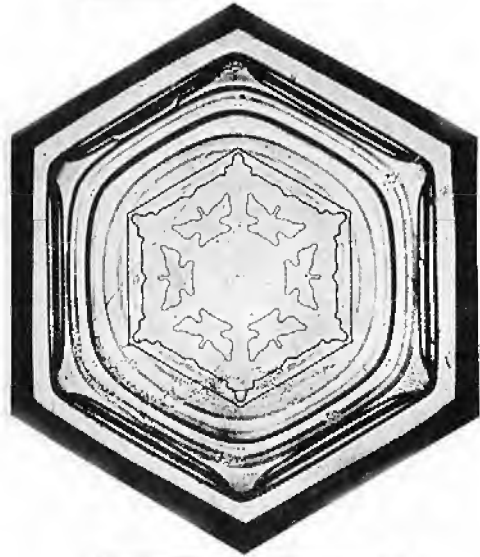
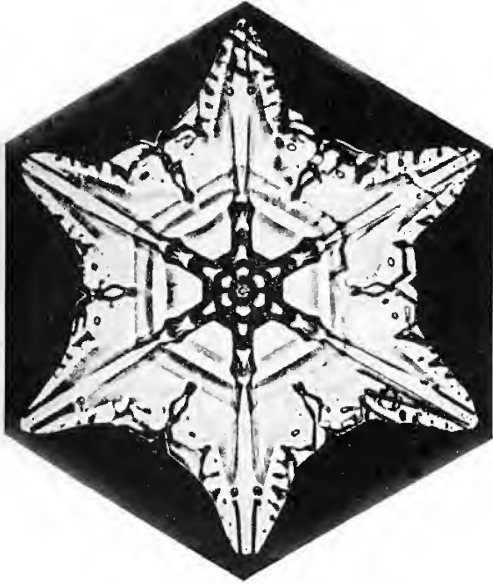


SNOWFLAKE SHAPES, PART 1:

Top left - A diamond pendant,
top right - a star fern,

middle left - another fernlike snowflake,
middle right – another lovely design,

bottom left – flake like a spider web.



SNOWFLAKE SHAPES, PART 2:

Top left – star form,
top right - the star flower

middle left - a feathery snowflake,
middle right – marvelous flake with
air tubes

bottom right – another marvelous
snow flake but in this instance, a
solid



Today that boy is Professor [Wilson Alwyn Bentley](#), authority on [snow flakes](#), and the [pioneer of snow crystal photography](#). He still uses his early methods; still uses the same [camera and lens](#).

"I can't remember the time I didn't love the [snowflake](#) more than anything else in the world," he said, as he told me the story of the [snow crystal](#)'s life.

When [Jack Frost](#) is about, Nature says, "I shall now create two different kinds of [snowflakes](#). I shall use my daintiest material, invisible water atoms, for [snowflakes](#) marvelously beautiful; but for the other sort I'll just give [Jack Frost](#) some of the coarser visible [cloud](#) vapor, and tell him to freeze it into plain little pellets, and toss them to earth."

The lovely variety, the [crystalline](#), Nature sends us in almost every [snow storm](#). Sometimes these [snowflakes](#) arrive in armies of trillions upon trillions; at times flying all bunched into one big flake, and at other times singly.

The unbeautiful, the granular variety, are wee [snow](#) balls, about the size of granulated sugar. Frequently while an exquisite [crystalline snowflake](#) is traveling on an earthward journey it is attacked by these mischievous granular [snow](#) balls, who [snow](#) ball him vigorously and sugar him all over until his beauty and shape are lost.

Occasionally a [snowflake](#) is born and grows up in one cloud, but more often storm and wind carry the tiny thing on long journeys, and as the crystal is buffeted about it adds to itself one new form after another.

There are many collisions among [snowflakes](#) while they are traveling, but Nature often provides for her injured little ones, and crystallizes them over again into new and perhaps even more beautiful and curious [shapes](#). Sometimes she creates a variety known to [science](#) as "cuff buttons", or "bobbins". These first are called "compound crystals", and are made up of two different kinds of [snowflakes](#). To make them, Nature catches a flake that is long and shaped like a tiny column, and attaches to each end a flat crystal.

And the longer ones, the "bobbins"! Dainty air-jeweled bobbins whereon the fairies must wind the mist and weave the stuff that dreams are made of! Or are they really sun-dials? Imagine fairies keeping tab on the sun in cold cloudland!

Some of these compound crystals have four wings, all standing out stiffly at right angles. They are "the four-winged butterfly" variety, and fly in zero weather from very high clouds.

The little [snow](#)-travelers that kiss our cheeks on a [winter](#) day are usually minute six-pointed snow-ferns, six-pointed stars, or like tiny six-branched pine or fir trees. Some take the form of a conventionalized six-petalled flower, while still others are just solid blunt-pointed hexagons. So, because its [usual number of sides or branches is six](#), and its angles are exactly sixty degrees, [science](#) declares the [snowflake](#) has a "signature", and signs itself as "six". However, a few [snowflakes](#) that arrive upon rare occasions from very distant clouds should sign themselves "three", for they have only three sides, being triangles.

If you look at a [snow crystal](#) under a microscope you will discover on the crystal's fragile surface most exquisite designs. They are traced by unbelievably minute hollow tubes filled with air. Glistening in the prismatic colors of the rainbow, or perhaps throwing dark shadows which lend depth, they add greatly to the crystal's frozen beauty. Let your imagination run for a minute: all this is in the space of but one-tenth of an inch in diameter, for that is the size of the average [snowflake](#).

No two [snow crystals](#) are shaped or ornamented exactly [alike](#). It is true that in a single storm Nature often uses a very similar pattern; but of a sudden, tiring, she surprises the world by tossing down a snow flake utterly different in all ways from any she has designed before.

Do you live in a northern climate? If so, have you seen those minute daggers of ice, all glittering and sparkling, that fill the [winter](#) early air? Too light to fall, they dance with [Jack Frost](#) under a clear, blue sky, inviting you to join their merry fun by stamping your feet. The dancers are bits of dust floating in the air. Nature covers these with water, and freezes them into "[ice spicules](#)", or "[ice needles](#)"; and in capricious mood she stings your cheeks with their sharp points.

Many motifs used in art and industry have come to us straight from the treasure of the [snow](#). Schools of design make use of the crystal's architecture. It may be that your silk gown holds a [snowflake](#)'s delicately etched markings, for the [silk](#) manufacturers call upon the crystal's aid. Many artists have been inspired to use its form and tracings for stained glass windows, or for mosaics. Jewelers frequently copy the [snow crystal](#) in filigree and more solid jewelry; metal workers have designed metal grilling from it; decorations for churches and other buildings sometimes owe their origin to the [snowflake](#) in all its varied beauty. Perhaps we never realize how great a [friend](#) we have in the tiny snow-messenger from the sky.

This article was reprinted from:

Lyon, Constance L. 1930. SNOWFLAKES: In the Making of Which Nature Shows Her Greatest Artistry. Nature Magazine, Washington, DC. 15(1): 19-21, 57. [Ed. Note: Nature Magazine was published by **The American Nature Association**. Modifications to the original article were made by the editor in order to accommodate formatting. Additional bios for the author & illustrator created by the editor.]

GETTING STARTED WITH KENTUCKY'S AQUATIC SNAILS

by T. Travis Brown



Many species can have interesting body coloration that one doesn't notice until you take a closer look. (*Elimia livescens* or *semicarinata*, who knows?)

To some folks, [snails](#) might seem like one of the most boring animals on the planet. Perhaps it's because they are small and slow-moving, but, as with many [invertebrates](#), when you take a closer look you find a fascinating and [diverse](#) group of animals. Our local [freshwater snails](#) can have bright body colors, beautiful [shell](#) architecture, and variation in physical characteristics that have confounded efforts to name species for centuries. Compared to their large cousins the [freshwater mussels](#), [freshwater snails](#) receive relatively little attention.

I've always been more of a [vertebrate](#) chaser, but last spring I participated in a [snail workshop](#) ([Floracliff Field Studies Program](#)) led by Ryan Evans (KY Division of Water) and David Hayes (Eastern KY University). They gave an excellent introduction to [snail ecology](#), where to find [snails](#), and some great information on [snail identification](#). One of the things that struck me is that we still aren't sure which [snails](#) are truly separate species. That means there is room left for naturalists to contribute basic information about [life history](#), [ecology](#), [relative abundance](#), and [distribution of freshwater gastropods](#).

There is still so much that we don't know because there aren't

that many people out there looking for [snails](#). There are a lot of discoveries and rediscoveries to be made. For instance, Ryan Evans and colleagues [recently rediscovered](#) [Rhodacme elatior](#) ([J. G. Anthony, 1855](#)) ([domed ancylid](#)), a rare [limpet](#) (Family Ancyliidae) that had not been officially known from the state since the 1800s.

The Major Groups

Our [freshwater snails](#) or [gastropods](#) ([Gastropoda](#)) are one member of the [Phylum Mollusca](#). Unlike the [freshwater mussels](#) ([Class Bivalvia](#)), [gastropods](#) have a single [shell](#). [Gastropods](#) were once lumped into two groups: the [pulmonates](#), which breathe using a lung and are hermaphroditic, and the [prosobranchs](#), which breathe using gills. However, these two groups are no longer used in formal taxonomy because they are polyphyletic, meaning they are not really that closely related genetically. They are still used informally in discussing groups by some but are now referred to as [pulmonates](#) versus [operculates](#). There are nine families, and approximately 59 species in KY, although species relationships are not well understood and exotic species are continually introduced. The family [Pleuroceridae](#) is the most speciose family in the state, with approximately 17 species.



Left: Snail with an operculum ([Pleuroceridae](#)). **Right:** Snail without an operculum ([Physidae](#))

Where to Look for Snails

[Snails](#) colonize virtually any kind of [aquatic habitat](#). It's hard to swipe a dip net through a semi-permanent wetland or pond without scooping up some [physid](#) or [planorbid snails](#). Many [pleurocerids](#) can be found in rocky riffles of streams, and some of the [large viviparid snails](#) inhabit the pools and runs. Pay particular attention to areas of vegetation, and look for small [snail](#) trails through silt. In cold weather you may have to look under rocks to find the periwinkle snails ([Elimia](#)) that inhabit many of our small streams. Shells of the larger species can be found washed up along the shores of [lakes](#) and large rivers, and many get deposited on sand a rock bars of creeks and rivers.

Snails and Water Quality

[Snails](#) have different levels of tolerance for pollution, and this makes them useful for [water quality monitoring](#). For instance, members of the [Family Physidae](#) are extremely tolerant of various kinds of pollution, and they are easy to recognize. They often reach high densities in ponds, wetlands, and sluggish streams where there is little oxygen. In contrast, members of the family [Pleuroceridae](#) require cleaner, cool, flowing water as they use gills to respire. If you see [pleurocerids](#) in a stream it is a good sign that the water is not grossly polluted.

Snail Conservation

[Aquatic snails](#) don't receive much attention when it comes to [conservation](#), but there are species in need of [protection](#). Perhaps the most horrible documented example of this need was the



Left: [Lithasia verrucosa](#) (Rafinesque, 1820), the varicose rock snail, is one Kentucky species in need of [conservation attention](#). **Right:** [Dreissena polymorpha](#) (Pallas, 1771), [zebra mussels](#) are just one of the challenges faced by freshwater snails.

building of a series of dams on the [Coosa River](#) in Alabama. Thirty-six species of [freshwater gastropods](#) and eight [mussels](#) are thought to have gone [extinct](#) during the conversion of the flowing riffles and shoals to impounded waters. This is considered to be the largest human-induced [extinction event](#) in modern North American history. Our other major group of aquatic [mollusks](#), the [mussels](#), are the most [endangered group of animals](#) in the country, and [snails](#) occupy a lot of the same habitats. However, [aquatic snails](#) also live in smaller streams, [caves](#), [springs](#), and seeps. All of these habitats face [habitat degradation](#) brought on by pollution (point source and non-point source), [invasive species](#), development, and siltation. In [Kentucky](#), none of our [aquatic snail](#) species have been listed by the [United States Fish and Wildlife Service](#), but there are a few species that are state listed or of potential management concern. The [Kentucky State Nature Preserves Commission](#) lists nine species as special concern.

Identification

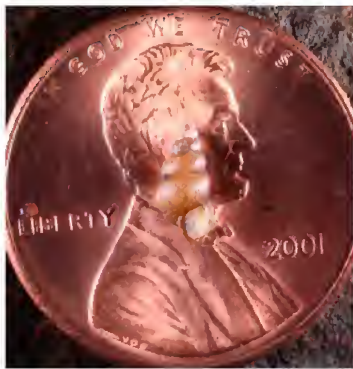
[Freshwater snails](#) are fairly easy to distinguish from other aquatic invertebrates, but there are a few confusing things to know. For instance, the [limpets](#) may look more like the egg of something attached to a rock than [snails](#) themselves (see photo below). Also, larvae in the [caddisfly](#) family [Helicopsychidae](#) built spiral-shaped homes out of tiny pieces of gravel that resemble [snail shells](#). To the un-trained eye, even a [water penny](#) (beetle larvae in family [Psephenidae](#)) may look as much like a [snail](#) as a [limpet](#).



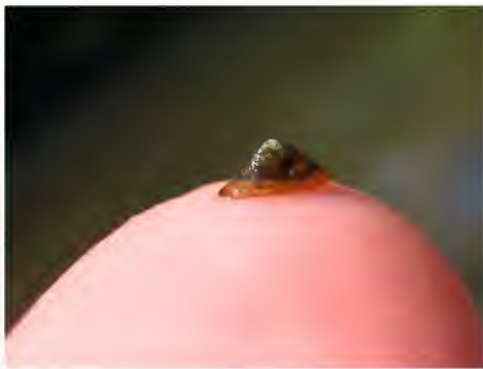
The spiral cases of [helicopsychid caddisfly](#) larvae resemble snail shells.

[Identification](#) to family is relatively easy, and many of the basic guides to freshwater invertebrates can help with this. Identification to genus and species becomes more difficult. The color and shape of some species can look different

depending on the size of stream where they are found, level of maturity, and concentration of certain elements in the water. Most identification of species currently relies heavily on determining which species is supposed to be in the stream you're looking at. In case that's not enough challenges to identification, there is quite a bit of argument as to what the names of various genera and species should be. As Ryan Evans says, "There's no shame in calling something [Elimia sp.](#) We don't really even know for sure which ones are good species names yet." Species have been described based on differences in their shells and where they are found, but quite a



Left: This is [Pomatiopsis lapidaria](#) ([Say](#), 1817), the [slender walker](#), one of our smaller snails placed on top of a penny. It is a tiny amphibious animal that lives in seeps and on moist hillsides. **Right:** [Ferrissia rivularis](#) ([Say](#) 1817), the [creeping ancylid](#), one of our tiny, hat-shaped aquatic snails in the limpet family ([Ancylidae](#)) on a finger tip.



bit of genetic work needs to be done to determine how closely related these different forms are. To me that's not discouraging, it just means that there is still a place to be a part of figuring it all out and contributing life history observations.

Our [freshwater snails](#) vary quite a bit in size and shape. Our largest native [snails](#), the [viviparids](#), almost reach the size of a golf ball, while a dozen of our smallest [snails](#) (the [hydrobiids](#) and [pomatiopsids](#)) will fit on a penny. The majority of our [snails](#) have a spiraled shell, but one group- the [limpets](#) ([Ancylidae](#)) have flat cone-shaped shells.

Here are a few useful resources:

Voshell, J. R., Jr., and A. B. Wright. 2002. [A guide to common freshwater invertebrates of North America](#). McDonald and Woodward, Blacksburg, VA.

Branson, B. 1987. Keys to the aquatic Gastropoda known from Kentucky. Trans. Kentucky Acad. Sci., **48**, 11-19. Available free with [Kentucky Academy of Science](#) membership.

Burch, J. B. 1982. [Freshwater snails \(Mollusca: Gastropoda\) of North America](#). U.S. Environmental Protection Agency. Report number 600/3-82-026. 294 pp. Available at: <http://nepis.epa.gov>

Dillon, R. Freshwater Gastropods of North America (some KY species found on this site). Available at: <http://www.fwgna.org/>

A Guide to Some of the Common, Easily Recognized Freshwater Snail Families

Below are a few photos of common species from our families of larger snails. With a little practice these families are easy to distinguish without the aid of a microscope. However, there are still many more species to check out in the families [Ancylidae](#), [Hydrobiidae](#), [Pomatiopsidae](#), and [Valvatidae](#).

Planorbidae

- thin to moderately thick shell
- shaped like a ram's horn...a flattened spiral
- lack an operculum
- found in streams, wetlands, ponds
- tolerant of low oxygen
- monoecious and oviparous (individual can fertilize itself and lays eggs)



Physidae

- thin-shelled
- aperture on the left when viewed with spire up
- lack an operculum
- found in sluggish streams, wetlands, ponds, muddy floodplain margins, and at the edge of flow under stream cobbles
- tolerant of low oxygen
- monoecious and oviparous



Lymnaeidae

- thin-shelled
- aperture on the right when viewed with spire up
- lack an operculum
- found in sluggish streams, wetlands, ponds, muddy floodplain margins, and at the edge of flow under stream cobbles



- very similar to [Succineidae](#) (land snail group found in wetlands) but have eyes at base of tentacles (rather than at end of tentacles in [land snails](#))
- monoecious and oviparous

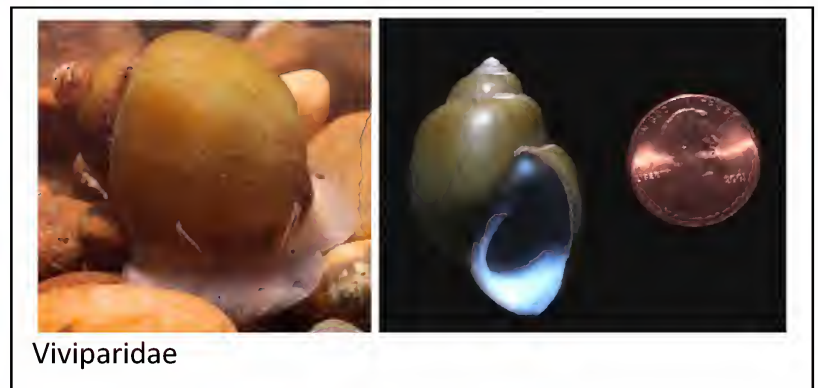
[Pleuroceridae](#)

- thick-shelled
- aperture on the right when viewed with spire up
- have an operculum
- dioecious (two sexes)
- shell shape is highly variable
- found in relatively high gradient streams



[Viviparidae](#)

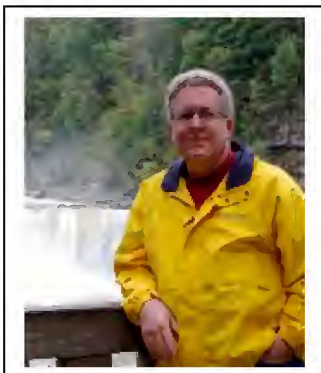
- thick-shelled
- aperture on the right when viewed with spire up
- have an operculum
- can reproduce sexually or via parthenogenesis
- ovoviviparous (eggs hatch inside and give birth to “live” young)
- often found in pools of streams and large rivers in sand or silt



T. Travis Brown is a biologist with [Eco-Tech Consultants, Inc.](#) He is a co-author of the [Pocketguide to Eastern Streams](#). More of his photography can be seen at: <http://brownswildimages.photoshelter.com/>.

GREETINGS FROM THE PRESIDENT

by Jeff Foster



Greetings from southern Ohio! As the bright January sun melts southern Ohio's first accumulated snow of the season, I am sitting here pondering the incredible task that is before me as the new President of the [Kentucky Society of Natural History](#). It is sort of overwhelming for me, when I look back over the years, and realize the size of shoes I have to fill. Our organization has been blessed with many great Presidents, including my mentor and dear friend, [Allen Lake](#).

Twenty-one years ago, Allen invited Becky and I to attend our first KSNH Conference. Over the years, the specific locations of conferences have all sort of blended together, but if I remember right it may have been at [Pine Mountain State Resort Park](#). Needless to say, we were impressed and had an incredible weekend. We were hooked! Little did I know, that many years later, I would be stepping into the president's position. What an honor!!

Many of you have known me and my family for that entire twenty-one year period, and please be assured, that you have become some of my very dearest friends. We think of many of you as family. For those who have joined the organization lately, and for “older” members who are not familiar with my background, I thought it would be a good idea to formally introduce myself.

I was born and raised in rural Adams County, Ohio; the only part of the “Buckeye” state, that is considered to be “the bluegrass” region. My father, a WWII veteran and part of “The Greatest Generation”, made sure that I was raised with a great appreciation for the natural world around me. He taught me to identify [trees](#), how to [fish](#), how to search for [mushrooms](#) and [ginseng](#), and most importantly a great respects for [nature](#). The love for the outdoors that he gave me, lead me to join the Boy Scouts of America, where my interest in nature guided me to my first actual job; a nature/ecology staff member at Camp Oyo in the [Shawnee State Park and Forest](#). I am proud to say that forty years later I am still active with BSA and that my family now includes three Eagle Scouts; myself and both sons. After high school, I attended [Southern State Community College](#) and then transferred to [Morehead State University \(MSU\)](#). It wasn't long before I truly considered Kentucky to be my second home. Over the next five years, I earned a Bachelors' Degree in Environmental Studies / Ecology and a Master's of Science in primarily field biology from MSU. It was at Morehead that I met some of Kentucky's best naturalists, including Les Meade, Fred Busro, Howard Setzer, Gerald DeMoss, and of course Allen Lake. These men not only instilled knowledge into me, but also a great love for the science of nature. While in graduate school at Morehead, I spent three summers as an Interpretive Specialist for the US Forest Service at Cave Run Lake. Full time employment brought me back to southern Ohio, but I never truly left my “second home” of Kentucky. I am currently an Associate Professor of Biology at [Southern State Community College](#), where I have been employed for the past twenty-six years. My wife, Becky, is a culinary arts instructor at our local [Ohio Valley Career and Technical Center](#) as well as at [Maysville Community College](#). Our oldest son Daniel, just complete his second Bachelor's Degree from [Morehead State University in Agriculture Education](#). Our youngest son, Adam, is a high school senior but is attending Southern State Community College full time. He plans to major in History.

I have a lot of ideas of things that I would like to see happen with our organization during my tenure as President. A few of these include; increasing out [Scholarship/Grant Program](#), more partnering and exposure with Universities throughout the state, partnering in natural history education with state and other private organizations, more exposure of the Society to the general public, and revitalizing local chapters throughout the state. I am looking forward to working with each and every one of you in the coming years. It will be a challenge to juggle time between teaching my courses here in Ohio and serving as the Society's president, however; I am up for the challenge and know that with the assistance of a great slate of officers and board members, we will get the job done!

I look forward to seeing many of you at our [Spring Conference in Shepherdsville](#), so mark your calendars for April 20 – 22nd, 2012. Registration is currently open and a great agenda of field trips and speakers will be available soon. Fall of this year will take us to my “old stomping grounds” in the Morehead area. I am in the process finalizing details for our Fall Conference there, tentatively scheduled for October 19 – 21st, 2012. I hope all of you have an incredible and safe winter, hang in there.....the wildflowers will be here soon!!

“I love to think of nature as an unlimited broadcasting station, through which God speaks to us every hour, if we will only tune in.” George Washington Carver

CHAPTER NEWS

Falls of the Ohio Chapter Events (see front cover for regular meeting times and place, field trip times may be found below or are to be determined. Contact Chapter President **Chris Bidwell** at (502) 896-4834 or via email at: mach5049@gmail.com for more information. Please send photos for viewing at the meetings to Coordinator **Susan Wilson** via email at (susanfltrn@yahoo.com).

2011 Dates	Event/Speaker or Leader	Topic / Outing
February 16	Margaret Shea	Landscaping with Native Plants – 7:00 PM @ Louisville Nature Center
February 25	Chris Bidwell	OUTING: Winter Tree I.D. Walk @ Cherokee Park-Baringer Spring Trailhead by "Frisbee Field" 9am-11am, followed by lunch and socialization at Mike Linnig's

		from noon til ?
March 15	Susan Riegler	Author of "The Complete Guide to Kentucky State Parks" will talk about her book – 7:00 PM @ Louisville Nature Center
March 17	Chris Bidwell	OUTING: Hike at "Anchorage Trail", an easy stroll led by Chris Bidwell, 10am
April 19	Ed Triner	Mushrooms – 7:00 PM @ Louisville Nature Center
May 17	Chris Bidwell	Native Wildflowers: Folklore & Interesting Trivia – 7:00 PM @ Louisville Nature Center
May 19	Chris Bidwell	OUTING: Yuko-En on the Elkhorn , Georgetown, Ky. Meet at Visitors Center for leisurely guided stroll to look at May wildflowers led by Chris Bidwell

KENTUCKY NATURALISTS' CALENDAR

(added as space and time allow)

2012:

February 2, 2012: Children's Program: Junior Naturalist - Winter Hideaways --Ages 7-11 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Discover how animals and people stay warm in winter, take a weather observation hike, and make icicles. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 4, 2012: Children's Program: Oh Deer! --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (11:00 AM). What is a habitat? We will take a walk outdoors looking for spaces that animals call their home. Then we'll come inside for story time and make a deer craft to take home. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 5, 2012: Owl Prowl @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). See the amazing birds active around dusk. Visit hot-spots within Bluegrass FWA's surrounding area. Bring your camera or binoculars and see avian predators like Short-eared Owls, Great Horned Owls, Prairie Merlins, Rough-legged Hawks, Northern Harriers, Bald Eagles, and Red-tailed Hawks. If you don't have binoculars, Wild Birds Unlimited will have loaners. Dress warmly. Meet at the main boat ramp/information station at Bluegrass Fish and Wildlife Area (Warrick Co., IN), 1/2 mile east of the Boonville-New Harmony Road/Interstate I64 Intersection (exit 15). Program fee: Free. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

February 8, 2012: Founders Lecture: "Uprooting Conventional Wisdom in the University Arboretum" by George Briggs @ Gluck Equine Center Auditorium, 1400 Nicholasville Road, Lexington, KY 40503 (7:00 PM). Founders Lecture Series presents George Briggs, Executive Director of the North Carolina Arboretum (434 acres) in Asheville, since 1987. He was also president of the American Association of Botanical Gardens and Arboreta, and chaired the first World Botanic Gardens congress. Cost: \$5/Friends of the Arboretum: FREE. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 9, 2012: Children's Program: Junior Naturalist - Tree Detective --Ages 7-11 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Learn clues that naturalists use to identify trees during winter and "adopt" a tree to study all year. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 14, 2012: Children's Program: Love the Earth! --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (10:00 AM). Celebrate love for the earth on Valentines' Day. Make a terrarium of green plants to take home and nurture. Bring a container appropriate for a small terrarium; we'll provide the plants. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 16, 2012: Children's Program: Junior Naturalist - Flying Adventures --Ages 7-11 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Birds sometimes have a difficult time finding food in the winter. Bring a carton to transform into a bird feeder for your backyard. We'll learn some techniques birders use to identify our feathered friends. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 18, 2012: Cabin Fever Festival @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (10:00 a.m. - 4:00 p.m.). Tired of winter? Come to the Interpretive Center for a day of activities, arts & crafts. Make a pinecone bird feeder, a colorful paper bouquet / sculpture, pet rock, and more! For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

February 19, 2012: Owl Prowl @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). See the amazing birds active around dusk. Visit hot-spots within Bluegrass FWA's surrounding area. Bring your camera or binoculars and see avian predators like Short-eared Owls, Great Horned Owls, Prairie Merlins, Rough-legged Hawks, Northern Harriers, Bald Eagles, and Red-tailed Hawks. If you don't have binoculars, Wild Birds Unlimited will have loaners. Dress warmly. Meet at the main boat ramp/information station at Bluegrass Fish and Wildlife Area (Warrick Co., IN), 1/2 mile east of the Boonville-New Harmony Road/Interstate I64 Intersection (exit 15). Program fee: Free. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

February 23, 2012: Children's Program: Junior Naturalist - Nature Nurturer --Ages 7-11 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Explore the importance of the native ecosystems of Kentucky. Go on a native plants walk, make a terrarium out of re-used materials, become an earth steward. Cost: \$1/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

February 24, 2012: Walk on the Wild Side-Nature Programs for Toddlers - Wiggly Worms @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). Toddlers 3-5 years old. 45 min - 1 hr interactive program will explore what nature has to offer. With each new topic toddlers will discover how wildlife and nature shapes the world we live in. Each program involves one or more activities including games, crafts, live animal visit, hike, or songs. Program fee: \$2.00 per person per session. Pre-registration is required. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

March 4, 2012: Children's Program: Make a Milk Carton Birdhouse --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (2:00 & 4:00 PM). Bring your own carton. Weather permitting and ONLY if the KCG is open. Cost: \$3/KCG members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 7, 2012: Little Sprouts Program: Windy Weather --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Make a pinwheel and hear a story about weather. Help us plant seeds indoors to transplant in the KCG. Cost: \$3/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 9, 2012: Walk on the Wild Side-Nature Programs for Toddlers - Tree Mural @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). Toddlers 3-5 years old. 45 min - 1 hr interactive program will explore what nature has to offer. With each new topic toddlers will discover how wildlife and nature shapes the world we live in. Each program involves one or more activities including games, crafts, live animal visit, hike, or songs. Program fee: \$2.00 per person per session. Pre-registration is required. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

March 10, 2012: Children's Program: Story time in the Garden --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (11:00 AM & 2:00 PM). Weather permitting and ONLY if the KCG is open. Cost: \$3/KCG members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 11, 2012: Children's Program: Make a Flower --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (2:00 & 4:00 PM). Weather permitting and ONLY if the KCG is open. Cost: \$3/KCG members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 14, 2012: Little Sprouts Program: Feathered Friends --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Discover what makes birds so special. Take a short hike to look for birds and make a nest to take home. Cost: \$3/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 17, 2012: Children's Program: Green is the Thing! --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (11:00 AM & 2:00 PM). Make a four-leaf clover. Weather permitting and ONLY if the KCG is open. Cost: \$3/KCG members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 18, 2012: Children's Program: Puddles, Ponds and Polliwogs --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (2:00 & 4:00 PM). Weather permitting and ONLY if the KCG is open. Cost: \$3/KCG members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 20, 2012: Riparian Zone Restoration @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (10:00 AM-noon). Instructors: Carmen Agouridis and Amanda Gumbert. Riparian buffers offer a number of ecosystem benefits related to water quality, stream bank stabilization, and habitat. They slow and capture runoff, which can improve water quality by trapping and filtering pollutants such as sediment, nutrients, and pesticides. We'll cover the main concepts behind the benefits of riparian buffers, removal of invasive plants, selection of native plants, planting, and maintenance. Cost: FREE. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 21, 2012: Little Sprouts Program: Little Critters --Ages 2-6 @ the Dorothea Smith Oatts Visitor Center at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (4:00-5:15 PM). Learn about our insect pals and about metamorphosis. Make a butterfly to take home. Cost: \$3/. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 22, 2012: Founders Lecture: "Native Flowers, Shrubs, and Trees Attractive to Honey Bees" by Tammy Horn @ Gluck Equine Center Auditorium, 1400 Nicholasville Road, Lexington, KY 40503 (7:00 PM). Founders Lecture Series presents George Briggs, Executive Director of the North Carolina Arboretum (434 acres) in Asheville, since 1987. Eastern Kentucky University professor Dr. Tammy Horn is an apiculturist, a scholar of bee keeping. She is author of two books: *Bees in America: How the Honey Bee Shaped a Nation* (2005) and *Beeconomy: What Women and Bees Can Teach us About Local Trade and The Global Market* (2011). Cost: \$5/Friends of the Arboretum: FREE. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

March 23, 2012: Walk on the Wild Side-Nature Programs for Toddlers - Who Lives in a Tree @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). Toddlers 3-5 years old. 45 min - 1 hr interactive program will explore what nature has to offer. With each new topic toddlers will discover how wildlife and nature shapes the world we live in. Each program involves one or more activities including games, crafts, live animal visit, hike, or songs. Program fee: \$2.00 per person per session. Pre-registration is required. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

March 31, 2012: Children's Program: Beginner Birding --Ages 5-10 @ in The Kentucky Children's Garden (KGC) at The Arboretum, 500 Alumni Drive, Lexington, KY 40503 (11:00 AM & 2:00 PM). Make a four-leaf clover. Weather permitting and ONLY if the KCG is open. Cost: \$3/KCG members free. For more information, or to pre-register, call (859) 257-6955 or visit the Arboretum's website at <http://www.ca.uky.edu/arboretum/>.

April 14, 2012: Raptor Day @ Charlestown State Park, in Indiana, 1 mile east of the intersection with Hwy 3 (Charlestown) on Hwy 62 (turn right) (10:00 a.m. to 4:00 p.m.). Learn about birds of prey and bird watching. Hardy Lake Raptor Rehab Center will bring

several of their birds for visitors to see up-close. Telescopes will be set up to observe birds in their native habitat. Non-live raptor programs guided by Naturalist at Heart Volunteers from the Falls of the Ohio State Park. There will be plenty of bird-watching opportunities, owl pellet dissection, children's activities, and more! Gate fees apply - \$5 per vehicle, Indiana residents, \$7 per vehicle, non-residents, FREE for Indiana State Park card holders. Programs are free with admission. For more information visit their website (combined with Falls of the Ohio State Park) at <http://www.fallsoftheohio.org/>, write them at P.O. Box 38, Charlestown, IN 47111, or call them at (812) 256-5600.

April 20-22, 2012: Kentucky Society of Natural History 2012 Spring Meeting @ Shepherdsville, KY. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

April 25-29, 2012: Ohio Valley Birding Festival @ multiple locations in southwestern Indiana and western Kentucky. The Ohio Valley Birding Festival is an Evansville Audubon Society event in partnership with Indiana's Wesselman Nature Society and Kentucky's John James Audubon State Park. The events feature guided spring migratory bird watching hikes. Areas featured for guided tours include Goose Pond Fish and Wildlife Area; Bluegrass Fish and Wildlife Area; Wesselman Woods Nature Preserve; Eagle Slough Natural Area; John James Audubon State Park; Lincoln State Park; Squaw Creek Mine; Howell Wetlands; Cane Ridge Unit of Patoka River National Wildlife Refuge including Lake Gibson; Oakland City Unit of the Patoka River National Wildlife Refuge; Twin Swamps Nature Preserve; New Harmonie State Park; and a canoe trip to Hovey Lake. A "Big Day" of birding will be offered for the more adventuresome birders. There is also a Family Day at Wesselman Woods Nature Center where members of the Evansville Audubon Society and Southwest Indiana Master Naturalists present a fun-filled day for the whole family! There are games, hands-on displays, workshops and lots and lots of fun for everyone, featuring over a dozen "birdy" activities that include making binoculars, a scavenger hunt, Bird Olympics, making a bird feeder, and planting seeds that will attract birds to your yard. All Family Day activities are FREE to the public. The Key Note speaker for 2012 will be Chuck Mills. He will speak at the EVSC Career Center Assembly Hall in Evansville, IN. Chuck has been an avid birder since the late 1960's. His world list stands at nearly 2000 and he has an ABA (American Birding Association) list of 675. He has birded in all 50 states as well as Panama, Costa Rica, Ecuador, Mexico and 22 other countries around the world. For nearly 20 years, he has monitored the federally-endangered Least Tern population at Cane Ridge in Gibson County. This is only one of two nesting sites for the state of Indiana. He has watched the Least Tern population in Indiana increase from just 2 birds in 1986 to the over 300 that were present in 2011. Chuck is on the board of directors of the Indiana Audubon Society. He has given bird-related talks at numerous schools and organizations. For more information contact each of the following: 1) Evansville Audubon Society - 551 North Boeke Road, Evansville, IN 47711, <http://www.evvaudubon.org>. 2) Wesselman Woods Nature Preserve - 551 North Boeke Road, Evansville, IN 47711, (812) 479-0771, <http://www.wesselmannaturesociety.org/>. 3) John James Audubon State Park - 3100 US Highway 41 N Henderson, KY 42420-2055, (270) 826-2247, <http://parks.ky.gov/parks/recreationparks/john-james/>. The festival website is <http://ohiovalleybirdingfestival.org>. If you would like to volunteer to help with any of these activities, please contact Evansville Audubon Society's LD Harry at 812-867-0144.

April 25-29, 2012: Spring Wildflower Pilgrimage @ Great Smoky Mountains National Park, Mills Conference Center, 303 Reagan Drive, Gatlinburg, TN 37738. This is an annual five-day event in Great Smoky Mountains National Park (GSMNP) consisting of a variety of wildflower, fauna, and natural history walks, motorcades, photographic tours, art classes, and indoor seminars. Most programs are outdoors in GSMNP, while indoor offerings are held in various venues throughout Gatlinburg, TN. For more information send email to springwildflowerpilgrimage@gmail.com, or visit the website at <http://www.springwildflowerpilgrimage.org/>.

April 27, 2012: Walk on the Wild Side-Nature Programs for Toddlers - Pecking Proficiency @ Museum & Nature Center at John James Audubon State Park, 3100 US Highway 41 North, Henderson, KY 42419-0576 (4:00 p.m. -). Toddlers 3-5 years old. 45 min - 1 hr interactive program will explore what nature has to offer. With each new topic toddlers will discover how wildlife and nature shapes the world we live in. Each program involves one or more activities including games, crafts, live animal visit, hike, or songs. Program fee: \$2.00 per person per session. Pre-registration is required. Contact Julie McDonald at (270) 826-2247, or juliea.mcdonald@ky.gov, or at (270) 826-2247, or via website at: <http://www.parks.ky.gov/parks/recreationparks/john-james/>.

April 27-29, 2012: The Kentucky Ornithological Society's Spring Meeting @Kentucky Dam Village State Resort Park, Gilbertsville, KY. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.eku.edu/kos/birding.htm>.

May 11-12, 2012: Herpetology Weekend @ Natural Bridge State Resort Park, 2135 Natural Bridge Road, Slade, KY 40376-9701, (7:30 a.m. to 9:30 p.m.). Discover nature's most misunderstood critters! Experienced herpetologists will lead field trips into the [Red River Gorge Geological Area](#) to observe reptiles and amphibians in their native habitat. Most Saturday fieldtrips will be offered at

9:00 a.m. and 1:30 p.m. Collection is prohibited. Friday and Saturday evening presentations will focus on reptile and amphibian natural history and conservation. Some demonstrations will include live venomous snakes! Registration fee upon arrival. \$10/adult, \$3/ages 13-17, and free for ages 12 and under. For more information contact Tyler Morgan at tyler.morgan@ky.gov.

May 11 - 13, 2012: The Art and Science of Nature Journaling @ Pine Mountain Settlement School, 36 Highway 510, Pine Mountain, KY 40810. Betty Beshoar, visual artist, will team with Heather Housman, former botanist with the Kentucky State Nature Preserves Commission, to conduct the workshop. During walks on Settlement School property, they will describe and answer questions about trees, plants, birds and insects found on the way. With this information, participants will create their own nature journals, which include writing, drawing and water coloring. Nature journaling is a powerful tool to use in connecting more deeply with the natural world. This workshop is suitable for all skill levels. Beginners are welcome. Enrollment is limited to 12 people. Cost: \$250 and includes meals from Friday dinner through Sunday lunch, two nights lodging and all instruction. For more information, contact the Pine Mountain Settlement School at 606-558-3571 or 606-558-3542. You can also visit their website at <http://www.pinemountainsettlementschool.com/>.

May 12, 2012: Earth Day @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (10:00 a.m. to 4:00 p.m.). The Falls of the Ohio State Park will buzz with activity. Environmentally minded businesses and organizations from all over the region gather to share information, show off their accomplishments, and provide fun for the whole family. Special programs include live animals, children's activities, and more! Sponsored by Jamey Aebersold Jazz, Kentuckiana Air Education, The Trash Force, and The Falls of the Ohio Foundation. FREE ADMISSION!!! For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

May 12, 2012: Earth Day @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (10:00 a.m. to 4:00 p.m.). The Falls of the Ohio State Park will buzz with activity. Environmentally minded businesses and organizations from all over the region gather to share information, show off their accomplishments, and provide fun for the whole family. Special programs include live animals, children's activities, and more! Sponsored by Jamey Aebersold Jazz, Kentuckiana Air Education, The Trash Force, and The Falls of the Ohio Foundation. FREE ADMISSION!!! For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

July 27-29, 2012: Midwest Native Plant Society's 4th Annual Midwest Native Plant Conference @ Bergamo Center, 4400 Shakertown Road, Dayton, OH 45430-1075. Join the Midwest Native Plant Society at their 4th annual meeting where a variety of recognized experts will speak and present field trips to explore native plants and wildlife in landscaping, forests, wetlands, and prairies. Speakers include: Ian Adams, environmental photographer, presenting "Gossamer Wings - The World of Dragonflies and Damselflies"; Marielle Anzelone, Urban Plant Ecologist in New York City, on greening the urban environment through ecosystem stewardship; David Wagner, entomologist and a professor of ecology and evolutionary biology, will talk about Caterpillars. He is also the author of Caterpillars of Eastern North America. After Wagner's talk there will be a field trip with mercury vapor lights and flashlights to find some caterpillars often only seen at night. There will be breakout sessions by recognized and informative speakers: Michelle Banker, David Brandenburg, Wes Duran, Don Geiger, Cheryl Harner, Jan Hunter, Jim McCormac, Carol Mundy, Tara Poling and Stan Stine. There will also be vendors with a variety of related items. For more information see their website at <http://www.midwestnativeplants.org/>, email them at mwnpsconference@gmail.com or call (513) 941-6497. There will be limited lodging at the Bergamo Center but other options are available. For lodging information go to <http://www.midwestnativeplants.org/Flyers/Lodging2011.pdf>.

August 4, 2012: Family Fun Fair @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (10:00 a.m. - 4:00 p.m.). Need a diversion before school starts? This event will keep the kid's (age 3 – 14) active and learning for hours! Join us inside the air conditioned Interpretive Center for a sampling of activities from all of our annual events. Meet Seaman the Newfoundland and get his 'pawtograph,' dissect and owl pellet, examine fossils, make and take your own sculpture from driftwood, do an 'Earth Day' scavenger hunt and more! Free with regular admission. Sponsored by the naturalists of the Naturalists at Heart volunteer program at the park. For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

September 22, 2012: Charlestown Under the Stars @ Charlestown State Park, in Indiana, 1 mile east of the intersection with Hwy 3 (Charlestown) on Hwy 62 (turn right) (10:00 a.m. to 4:00 p.m.). Co-sponsored by the Louisville Astronomical Society, this event will focus on stargazing. What is out under the night sky tonight? Learn about telescopes, how to find Polaris, discover the October constellations, bring your telescope that you haven't figured out how to use and learn how. If weather is overcast, the event will be held in the park office with an astronomy slide show and telescopes for examination. Gate fees apply - \$5 per vehicle, Indiana

residents, \$7 per vehicle, non-residents, FREE for Indiana State Park card holders. Programs are free with admission. Staffs at the Falls of the Ohio and Charlestown State Park have merged. As a result, programs and events at Charlestown will be coordinated by the same people. Coordinated by Alan Goldstein (agoldstein@dnr.in.gov). For more information visit their website (combined with Falls of the Ohio State Park) at <http://www.fallsoftheohio.org/>, write them at P.O. Box 38, Charlestown, IN 47111, or call them at (812) 256-5600.

September 28-30, 2012: The Kentucky Ornithological Society's Fall Meeting @ Mammoth Cave National Park, KY. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.eku.edu/kos/birding.htm>.

September 29, 2012 (TENTATIVE): Rock the Rocks @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (6:00-10:00 p.m.). More details to come! For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

October 13, 2012: Earth Discovery Day @ Falls of the Ohio State Park, 201 West Riverside Drive, Clarksville, IN 47129 (9:30 a.m. - 5:30 p.m.). This new event will focus on the world beneath your feet. It coincides with Earth Science Awareness Week and events across the nation. The park is planning a variety of interactive activities for adults and children. Inside the museum will be children's rock-craft activities. There will be fascinating geoscience speakers. Discover geology through a microscope with microfossils and microminerals. Learn how to photograph specimens (helpful if you want to get something identified by e-mail) and how to display them in your home or office. Free brochures from almost every fossil park in North America will be available. Teachers can sign up and win a 50, 75 or 100 piece geology collection. There will be free rock and fossil identification so bring in your unknowns! Outside there will be fossil and mineral dig piles, guided outer and Indiana shore fossil bed hikes. A surprise interactive exhibit is planned. Stay tuned for news in early 2012. Participating Organizations: Falls of the Ohio Foundation, Kentucky Paleontological Society, Indiana Society for Paleontology, Mineral And Fossil Interest Club (MAFIC), Indiana Geological Survey, Kentucky Geological Survey, KYANA Geological Society. Free with regular admission. For more information contact the park at (812) 280-9970, via email at park@fallsoftheohio.org, or visit their website at <http://www.fallsoftheohio.org/>.

October 12-14 or 19-21, 2012: Kentucky Society of Natural History 2012 Fall Meeting @ Pine Mountain State Resort Park. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

2013:

April 26-28, 2012: Kentucky Society of Natural History 2012 Spring Meeting @ Pine Mountain State Park. See upcoming newsletter for details or go to the website at <http://www.ksnh.org>.

April 26-28, 2012: The Kentucky Ornithological Society's Fall Meeting @ Carter Caves State Park, KY. For more information contact KOS at P.O. Box 463, Burlington, KY 41005 or via their website at <http://www.biology.eku.edu/kos/birding.htm>.



Kentucky Society of Natural History Registration Form
Spring Conference at Shepherdsville, KY
April 20 - 22, 2012

Registration is due by April 6, 2012

NOTE: Please pre-register if you do know you are coming as it will assist us in planning of field trips, as well as seating arrangements. Also note that we have dropped the registration fee by \$5 for our members.

Your Name: Last: _____ **First:** _____

Street Address: _____

City: _____ **State:** _____ **Zip:** _____

E-mail: _____ **@** _____ **Phone #** _____

Names (in your group, please print): _____

_____, _____, _____

General Registration:	NO.	Cost	Amount
Individuals (over 18) Member.....	_____	X \$25 \$	_____
Individuals (over 18) Non-member.....	_____	X \$30 \$	_____
Student	_____	X \$5 \$	_____

***Accommodations:** Country Inn and Suites, Shepherdsville, KY

Room prices do not include local taxes. Standard-two queen beds \$80.99 Standard-king room \$80.99 2 queen two room suite with pullout sofa bed \$125.99. Hot breakfast is included. The Inn is within walking distance to our conference meeting room (Paroquet Springs Conference Center). **Make your own reservations by calling 502.543.8400.** The address is 400 Paroquet Springs Drive, in Shepherdsville. Mention that you are a KSNH member to get the discounted price.

***children 18 and under stay free in parents' room, and \$10.00 for each additional adult.**

There are other motels in the area, but this one is the closest to our meeting room in. There is also a KOA campground in the area.

Waiver of Liability for the Spring Conference
Member and/or Participant (Must be executed by All Registrants)

EVENT: Shepherdsville, Kentucky Spring Conference DATE: April 20 - 22, 2012

I understand that I am a participant in this field trip/event. I release the Kentucky Society of Natural History and/or its officers from all liability for accident, injury, illness, or loss of property for myself and/or my dependent(s) and agree to indemnify and save harmless the sponsors from accident, illness, or injury to others or loss of their property caused partly or wholly by me and/or my dependent(s) while engaged in any voluntary activity supported by the sponsors.

Please note: In Kentucky and most other states an individual may accept a particular risk of harm resulting from another party's conduct. An express release by which one party agrees to assume the risk of harm arising from another party's negligent conduct will be enforced by the courts so long as it does not release liability for willful or gross negligence and does not otherwise offend public policy. By signing this release, you are not only agreeing that you will not sue the Kentucky Society of Natural History or its officers should one or more of its members or officers cause you harm; you are also protected from being held liable as long as your conduct is not grossly negligent or intentional.

Signatures: _____ **Date:** _____

Make checks payable to KSNH no later than April 6, 2012 and send this form with payment to KSNH treasurer, PO Box 883, Fairdale, KY 40118-0883. For additional details, call Pat Meyer 502.368.4378

The mission of the **Kentucky Society of Natural History (KSNH)** is to actively promote study and interest in Kentucky's rich natural heritage throughout the Commonwealth. Members are typically interested in a broad spectrum of natural sciences and related fields. Among the more prominent activities of the KSNH, are the annual spring and fall Conferences, selection of a "Naturalist of the Year", nature photography contests, research grants, and a variety of knowledgeable speakers and field trips. We invite anyone who shares our interests to [join us](#). **Your membership is critical to preserving our mission.**

For membership information or to submit dues please visit our [website](#) to pay using [paypal](#) or your credit card. For the [mail-in form](#) please send to:

Kentucky Society of Natural History, P.O. Box 883, Fairdale, KY 40118-0883,

Individual \$15, Family \$25, Full Time Student \$7.50, Lifetime: \$300.

The Kentucky Society of Natural History is an official 501(c) (3) tax-exempt nonprofit organization which was formed in 1939, and incorporated in 1943 in Louisville, Kentucky. All contributions to THE KENTUCKY SOCIETY OF NATURAL HISTORY are tax-deductible to the full extent of federal and state income tax laws.

Published quarterly, The [Kentucky Naturalist News](#) is the official newsletter of KSNH. Unsolicited contributions are encouraged. Please send articles to: **Gretchen Fitzgerald, KNN Editor, P. O. Box 21182, Louisville, KY 40221.** You can also email newsletter submissions by sending them to gretchfitzgerald@gmail.com.

Kentucky Naturalist News Deadlines & Schedule:



<u>Issue</u>	<u>Deadline</u>	<u>Tentative Publish Date</u>
Spring Issue	February 1, 2012	March 1, 2012
Summer Issue	May 1, 2012	June 1, 2012
Fall Issue	August 1, 2012	September 1, 2012
Winter Issue	November 1, 2012	December 1, 2012

For submissions, plan on 0.5-inch margins, 10 pt Arial or Calibri font, and about 2 photos per page. Please leave the photo images in full-size and do not optimize them. Please cite references. To assist, you may use: <http://www.lib.ncsu.edu/lobo2/citationbuilder/citationbuilder.php>.



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